JPRS L/8998

25 March 1980

USSR Report

ENERGY

(FOUO 2/80)

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ENERGY

(FOUO 2/80)

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ELECTRIC POWER

UDC 621.31.002.2:624.152.632

USE OF LIGHT ENCLOSURE STRUCTURES IN URALS, SIBERIA

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 12, 1979 pp 2-5

[Article by V.P. Pavlov, V.G. Novikov, engineers and V.I. Stepanov, candidate of the engineering sciences]

[Text] Light support and enclosure structures of an increased level of factory prefabrication are being developed by the Urals division of the Teploelektroproyekt [All-Union State Institute for the Design and Planning of Thermal Electric Power Stations] and are being widely used in the design of heat and electric power stations. The reduction in the weight of the enclosure and support structures makes it possible to significantly curtail the labor expenses at the construction site as well as transportation outlays. The latter factor is no small importance, since the individual facilities being planned by the institute are located in difficulty accessible and remote regions, shipments to which are made on a seasonal basis.

As is well known, one of the first facilities at which light enclosure structures of profiled sheet steel and an efficient insulating cover were widely used was the Surgutskaya GRES. Some 18,486 m^2 of wall panels of profiled sheet with vermiculite insulation covering, 31,200 m^2 of metal roof panels and 8,000 m^2 of profiled sheet partitions were installed for the first time in the construction of the first stage of the electric power station. Because of this, the weight of the enclosure structures was reduced by 18,250 tons, while the labor outlays at the construction site was reduced by 20,900 man-days. Transportation expenditures were reduced by 440,000 rubles.

Subsequently, in designing and construction the second stage of the Surgutskaya GRES, the engineering designs employed previously were refined, something which allowed for a reduction in the consumption of steel and an additional economic impact amounting to 169,000 rubles.

The utilization of profiled sheet steel and a light insulation cover has made it possible to redesign the coverings for the main buildings of TES's [thermal electric power stations]. Thus, blocks covering a span of 51 m using the lightened panels were developed for Reftinskaya GRES

in conjunction with the TsNIIPSK [Central Scientific Research Institute for Shaped Structural Components].

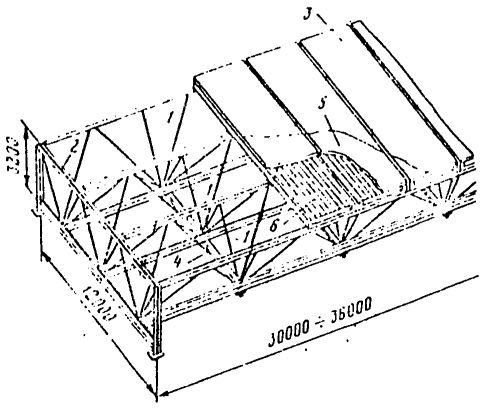
The large volume of light enclosure structures being introduced has been provided by the Urals division of the institute in the project plan for the Permskaya GRES. Metal wall panels, a method of suspension fastening of wall panels, the enclosure structures for the fuel feed trestles, and the structural components of the temporary end faces have been designed, tested and introduced at various power facilities by the department of experimental operations.

Cover Blocks for the Main Buildings of TES's. As is well known, both individual polygonal trusses and modular structures of various types (the Uglegorskaya, Reftinskaya GRES, etc.) are used for the covering of the main buildings of TES's. The modular method of installing covers makes it possible to shift the high work on the installation of the individual components, the laying of the rubberoid mat and the protective gravel layer over to a consolidated site (to reduce the labor intensity of the cover installation). In this regard, a variant of the modular structure for the cover of the main building of the Novosverdlovskaya TETs was worked out by the Urals division, taking into account the experience with the modular installation method for UMK series structures at the Surgutskaya GRES. Having ascertained that the structural design of the roof panels can be lightened with the installation of additional rafter structures, the designers adopted a structural configuration consisting of trusses inclined obliquely against each other, where these trusses rested on subtruss structures. The upper booms of the roof trusses were joined together by the longitudinal ribs of the roofing panels, while the lower ones are joined together by linear components. For the purpose of standardizing the roof trusses and facilitating their transportation, the height of the three-dimensional block was chosen as 3.2 m (see the Figure).

Lightened metal roof panels with an increased level of plant prefabrication were developed for the covering of three dimensional block.

The metal used for a covering consisting of single polygonal trusses and for the proposed covering is shown in Table 1. It can be seen from the data of Table 1 that 30 percent less metal is used for the fabrication of the cover block developed by the Urals TEP [All-Union State Institute for the Design and Planning of Thermal Electric Power Stations], than is called for in the standard project plan. The use of this structure at the Novosverdlovskaya TETs allowed for a reduction in steel consumption of 370 tons.

Wall Enclosure. PSM brand horizontal metal wall panels have been developed by the Urals division of the Teploelektroproyekt Institute. These panels were used in the construction of the main building of the Surgutskaya GRES, as well as for the temporary end faces of the main buildings of the Troitskaya GRES, the Permskaya TETs-14, and others. Experience in the



Overall view of the three-dimensional cover block.

Key: 1. Inclined roof trusses; 2. Support trust; 3. Metal cover panels; 4. Braces for the bottom stringers of the roof trusses; 5. PCB type cover insulation; 6. Profiled steel decking.

fabrication, transportation, installation and operation of the PSM type wall panels for more than five years has demonstrated that they are simple and well suited for fabrication and installation, and their transportation in containers allows for significantly curtailing the times for performing the work and simplifies the warehousing scheme. A metal enclosure meets the requirements of standards in a thermal engineering sense and is not inferior to the keramzit [clay concrete] one.

Taking the positive experience with the use of wall enclosures made of horizontal metal panels of the PSM type, a lightened structural design for panels of this type was developed and used in the construction of the second stage of the Surgutskaya GRES.

The technical and economic indicators (per square meter) of variants of the enclosure structures used in the erection of the first and second stages of the Surgutskaya GRES are shown in Table 2.

The Suspension Fastening of Wall Panels to Columns. The structures widely used at the present time for fastening wall panels of production buildings have a number of drawbacks, in particular, a comparatively high metal consumption and installation labor intensity, since the individual fastening components are welded during the process of installing the panels at a height.

A suspension method for fastening the various wall panels to steel reinforced concrete or steel columns of a building by means of a single type of fastening parts has been developed in the Urals TEP. This method differs from the existing ones by the presence of a spring type clamp between the contact surfaces of the fastening parts, where this clamp assures self-clamping of the wall panels during the installation process, something which allows for completely avoiding welding operations, performed at a height during the installation of the panels.

TABLE 1

Конструкции Structures	(1) Блок покрытия из одиночных ферм				(2) Блок покрытия УралТЭПа			
	(3) Машинный зал L = 30 м		(4) Котельное отделение L = 36 м		(3) Машинный зал L = 30 м		(4) Котельное отделение L = 36 м	
	Общая масса, т (5)	Удельная масса, кг/м² (6)	Общая масса, т (5)	Удельная масса, кг/м² (6)	Общая масса, т (5)	Удельная масса, кг/м² (6)	Общая масса, т (5)	Удельная масса, кг/м² (6)
7. Стропильные фермы	153,7	21,3	187,2	22,8	144,5	20,1	173,8	21,2
8. Подстропильные фермы	—	—	—	—	42,9	5,9	42,6	5,1
9. Связи (вертикальные и горизонтальные)	36	5	37,3	4,54	—	—	—	—
10. Распорки	53,7	7,4	61,3	7,47	10,1	1,4	8,3	1
11. Щелевые фонари	—	—	80,9	9,9	—	—	63,3	7,9
12. Поддон	—	—	84,4	10,3	—	—	41,4	5
Total Итого	243,4	33,7	451,1	55	197,5	27,4	329,4	40,2
13. Панели покрытия	278	38,6	260	31,7	178	24,7	156	19
In all Всего	521,4	72,4	711	86,6	375,5	52,1	485,4	59,2
14. Пространственный блок	27,8	77,1	40,6	93,9	20,4	56,8	28,7	66,4

Key:
1. Cover block consisting of individual trusses;
2. The cover block for the Urals TE [All-Union State Institute for the Design and Planning of Thermal Electric Power Stations];
3. Turbine room, L = 30 m;
4. Boiler room, L = 36 m;
5. Overal weight, tons;
6. Specific weight, kg/m²;
7. Roof trusses;
9. Couplings (vertical and horizontal);
10. Braces;
11. Slot skylights;
12. Bottom plate;
13. Cover plate;
14. Three-dimensional block.

TABLE 2

Indicators	Keramzit [clay concrete] PSK and PSKP [panels]	Metal PMS Panels	
		Stage I	Stage II
Labor outlays, man/hours:			
For the fabrication	1.206	1.76	1.47
For the installation	1.9	0.49	0.49
Cost of the structures, rubles	52.31	48.44	37.8
Capital investments, rubles	21.04	18.45	13.56
Operational expenditures, rubles	17.36	21.76	21.76
Referenced specific capital investments, rubles	3.82	3.21	3.29
Increase in the cost of wintertime work, rubles	3.4	3.71	3.71
Additional outlays for the maintenance of the builders and installers for the case of identical construction times, rubles	5.41	0	0
Referenced expenditures, rubles (%)	82.3(100)	77.12(94)	65.66(80)

TABLE 3

Indicators	Fastening Supported on Pads	Suspension Fastening
Metal consumption for the fabrication of the insert and installation parts, kg/m^2	2.76	0.86
Labor intensity for the execution of the welding operations when fastening the installation parts, man/hour/m^2	0.049	0.022

The fastening parts are made as part of the panels at the plant; the panels arrive at the construction site completely ready for installation.

The use of the new method of fastening wall panels permits a significant simplification of the fabrication of steel reinforced concrete columns: light insert parts at the corners of a column are installed instead of the heavy insert parts beneath the support pads.

In the fabrication of keramzit concrete wall panels, it is necessary to install two insert parts at the upper (during the pouring of the concrete) surface of the panel, something which does not lead to a change in the production technology already developed for the panels.

TABLE 4

Indicators	Traditional Design (girder configuration)	Structural Panel Design
Overall dimensions of the end wall, m:		
Height	21	21
Width	30	30
Thickness	1	1
Overall steel consumption, kg/m^2:		
Bridge truss	108	67
Frame	28	23
Wall panel	48	22
Labor outlays for installation, man/hour/m^2	2.1	0.9
Cost of the end wall, rubles/m^2	67.3	40.5

The suspension method of fastening wall panels has been implemented at the Novosverdlovskaya TETs and the Surgutskaya GRES construction projects. The data given in Table 3 attests to the effectiveness of such fastening of the keramzit concrete panels to the steel reinforced concrete columns.

The Structural Panel Design for the Moving End Wall. Up until the present time, the moving portion of the end wall has been designed on the girder rolling cage principle and consists of horizontal collar beams (wind trusses) and vertical posts. In this design solution, it is necessary to install additional vertical and horizontal, longitudinal and transverse ties. All of this leads to an increase in the use of metal for the framework. Moreover, this solution does not allow for the installation of the end structure using progressive methods.

The Urals division of the Teploelektroproyekt Institute, in conjunction with the department of structural components of the UPI [Urals Polytechnic Institute imeni S.M. Kirov has designed a structural panel type moving section for the temporary end face. The principle of combining support and enclosure functions is efficiently utilized in this structural design.

Tests of models ascertained the high reliability and rigidity of the structural panel design. As compared to the traditional end for the turbine room, the structural panel end face sustains elevated wind loading (3.2 as against 0.6 KN/m^2) and has sufficient stiffness in this case (the sag amounted to 1/260th of the span length of the structure). It should be noted that the cross-sections of the majority of the components in both the model and in the working design of the end face for the Permskaya TETs-14 were matched in terms of their structural design and have safety margins of strength and stability, something which is confirmed by the results of the tests.

A technical economic comparison of the end face variants is shown in Table 4. The structural panel design of the ends was introduced at the Permskaya TETs-14. The support structures for the moving portion of the end face were fabricated by the Central Urals Metal Structures Plant, while the wall panels were made by the Mironovka steel reinforced concrete structures plant. The structures were shipped to the construction site by rail. On the whole, the labor outlays for the installation of the structural panel end face of the Permskaya TETs-14 amounted to 550 man-hours, i.e., half of that for the installation of the traditional end face.

The Above-Ground TES Fuel Feed Trestles. The high material consumption of the fuel feed tressles is due to the large weight of the enclosure structures (the load due to the inherent weight of the enclosure on the span structures in individual cases amounts to about 70 percent of the overall loading), and the high labor intensity for their erection is due to the considerable volume of manual processes (putting down the paper roll roofing, fastening, the [zamonolichivaniye] of the joints, the chamfering of protruding structures), as well as the large number of small components to be installed high up.

A working project plan for the fuel management of the Troitskaya and the second stage of the Reftinskaya GRES, as well as the Novosverdlovskaya TETs, which provides for the installation of conveyors with belts 1,600 and 2,000 mm wide respectively has been worked up on the basis of the developmental work performed by the Urals TEP.

Composite arched panels of profiled sheet steel and vermiculite insullation cover were used as the enclosure components for the hipped roof of the trestles. Positive results from the tests and the fabrication

TABLE 5

Indicators	Standard Type Gallery of VKT3.5-3 Components	Arched Gallery	
		At the Reftinskaya GRES (Variant I)	Standard Type (Variant II)
Reinforced concrete and concrete consumption, m^3	10.32	12.32	9.84
Including:			
Prefabricated reinforced concrete	6.49	10.57	8.09
Monolithic reinforced concrete	2.12	0.61	0.61
Monolithic concrete	1.71	1.41	1.14
Fittings used per m^3 reinforced concrete concrete, kg	203	157.5	153.9
Weight of the installation parts, kg	77.7	174.8	174.6
Labor outlays for the fabrication of the prefab reinforced concrete structures at the plant, man-days	6.28	6.25	5.05
Labor outlay at the construction site, man-days	12.12	8.02	6.92
Cost of the structures, rubles	1,485	1,723	1,359
Operating expenses, rubles	295	241	192
Referenced specific capital investment, rubles	91	116	90
Increase of the cost for work during the winter	92	94	75
Referenced outlays, rubles	1,963	2,174	1,716
The one-time economic impact due to the acceleration of placing the facility in service, rubles	0	837	1,061
Referenced expenditures, taking the one-time impact into account, rubles	1,963	1.337	655

technology simplicity of the structural designs of the trestles for the fuel feed have made it possible to recommend this structural design for widescale introduction. The production of the hipped roof structures was mastered by the Mironov Steel Reinforced Structures Plant, while the overhead cover panels are produced by the Svetlovodsk Metal Structures Plant of the Dneproenergostroyindustriya production association.

A comparison of the different vairants of the fuel feed trestles shows that the use of the metal structures permits a reduction of four times in the weight, a reduction by more than a factor of two in the labor expenditures and by 1.2 times in the cost of trestle construction, and also creates conditions for the modular installation of the structures.

The installation was accomplished at the Troitskaya and Reftinskaya GRES in consolidated sections 12 to 15 m long with fully installed production process equipment and the floor in place.

The Underground Fuel Feed Galleries for the TES. The development of arched trestles for fuel feed from profiled sheet metal has permitted an improvement in the conditions for servicing them, and practically eliminated protruding structural components, on which dust can be deposited. However, the underground fuel feed galleries, as before, are made from rectangular VKT3.5-3 components, something which complicates their operation because of the difficulty of installing repair junctions through the conveyors and the presence of posts in the central passageway.

A prefabricated arched structure for the underground steel reinforced galleries, consisting of a bottom plate and two half-arches was developed by the Urals TEP in the project plans for the new fuel feed channels for the Reftinskaya, Troitskaya GRES's and others.

The engineering economic indicators for the structural variants are given in Table 5.

It can be seen from Table 5 that just the use of variant I of the arched galleries, which has an increased consumption of materials as compared to galleries made of the VKT3.5-3 components, allows for a significant reduction in labor outlays at the construction site (by 34 percent) and thereby assures an economic impact from its introduction as a whole.

8225
CSO:1822

ELECTRIC POWER

UDC 621.315.1.001.2

IMPROVED INTRODUCTION OF POWER LINE DESIGNS

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 12, 1979 pp 17-20

[Article by L.L. Peterson, O.V. Belova, V.A. Khor'kov, engineers and Yu.A. Gabliya, candidate of the engineering sciences]

[Text] Putting Together a Calendar Plan for the Implementation of New Solutions and the Preparation of the Technical Documentation

Experience in the development and implementation of new technical solutions, which has been accumulated by the Energoset'proyekt [Power Network Design and Planning Institute] has made it possible to ascertain a number of serious defficiencies:

--The lack of a critical approach to the selection of new technical solutions, being planned for implementation;

--A lack of coordination in the work with organizations on which the implementation of the new technical solutions depends (the plants of the construction industry, subcontractors and customers);

--Poor quality in drawing up the engineering documentation and nonconformity of the contents of this documentation to the requirements of the builders (the lack of production process charts, recommendations for the organization of construction, etc.);

--The lack of flexibility, a planned approach, coordination and consistency in the work of the subdivisions of the institute in the implementation of the new engineering design solutions, as well as a clear cut system of accounting and reporting;

--Inadequate attention paid to the operationally timely organization of intelligible information on the new engineering solutions.

The implementation of a set of measures is being planned for the purpose of improving the work of the institute in the implementation of new

engineering solutions in the practice of electrical power network construction in the 11th Five-Year Plan.

According to preliminary data, it is planned that more than 60 engineering design solutions, including those which have not yet found mass application, will be introduced in the 11th Five-Year Plan.

A preliminary listing of these design solutions has been sent around to the divisions of the institute, the main administrations and specialized trusts of the USSR Ministry of Energy for Coordination and Correction.

After replies are received from the organizations and the remarks and proposals made are considered, the approximate scope and area of implementation of each new engineering solution will be determined, sessions of the scientific and engineering councile will be held, in which representatives of the organizations will participate who have studied the new engineering design solutions.

The scientific and engineering council of the Energoset'proyekt Institute should approve the final listing of the new engineering solutions and prepare the draft plan for the appropriate order of the USSR Ministry of Energy, and coordinate this with the main administration - the coperformers of the work.

The Energoset'proyekt Institute will also prepare a calendar plan for the implementation of the engineering solutions, developed in accordance with a definite form (see form 1), in the form of appendices to the order.

Following approval by the management of the USSR Ministry of Energy, the implementation of the indicated new engineering solutions becomes obligatory for all coperforming organizations.

The authorized listing of new engineering design solutions is intended for the 11th Five-Year Plan. Additions or changes can be made only in exceptional cases with the agreement of the main coperforming administrations, and are to be approved by the management of the USSR Ministry of Energy. All of the new technical developments, inventions, etc. concerning electric power network questions which come up during the 11th Five-Year Plan in the Energoset'proyekt Institute or in other organizations of the USSR Ministry of Energy, will be considered in the institute and prepared for implementation in the subsequent Five-Year Plan.

When studying the list of new engineering solutions for the 11th Five-Year Plan, the management of the institute preliminarily links the various engineering solutions to specific electrical power transmission line facilities and substations at 220 KV and above, the planning and construction of which is planned for the period from 1981 through 1985.

FORM 1

(1) КАЛЕНДАРНЫЙ ПЛАН
внедрения новых технических решений

Наименование нового технического решения	Объект внедрения	Объем внедрения	Наименование проектной организации	(6) Срок проектирования		Наименование строительной организации	(10) Срок строительства	
				начало	окончание		начало	окончание
(2)	(3)	(4)	(5)	(7)	(8)	(9)	(7)	(8)

(11) Подпись представителя проектной организации (*Главниипроект*)

(12) Подпись представителя строительной организации (*Главвостокэлектросетьстрой, Главцентрэлектросетьстрой*)

(13) Подпись представителя стройиндустрии (*Главэнергостройпром, Энергостальконструкция*)

Key:
1. Calendar plan for the implementation of new engineering solutions;
2. Designation of the new engineering solution;
3. Facility where the solution is to be implemented;
4. Scope of the implementation;
5. Designation of the project planning organization;
6. Timeframe for the project planning;
7. Start;
8. Finish;
9. Designation of the construction organization;
10. Timeframe for the construction;
11. Signature of the representative of the project planning organization (Glavniiproyekt);
12. Signature of the representative of the construction organization (Main Eastern Electrical Power Network Construction Administration, Main Central Electrical Power Network Construction Administration);
13. Signature of the representative of the construction industry (Main Power Engineering Construction Industry Administration, Power Engineering Steel Structural Design Administration).

FORM 2

Developer:
Belorussian Division

DESIGNATION OF THE SUBJECT

(Using the example of cable protection against ice for the supports of open wire power lines)

Разработчик:
Белорусское отделение

НАИМЕНОВАНИЕ ТЕМЫ

(на примере тросовой защиты опор ВЛ от воздействия льда)

Economic Indicators / Экономические показатели	(1) Этапы разработки: 1975 г.	1976 г.	1977 г.	1978 г.	1979 г.	1980 г.	1975—1980 гг.
(2) *Планируемые (проектные)*							
(3) Объемы внедрения (количество опор)	3	10	10	20	20	30	93
(4) Экономия:							
5. металла, тыс. т	—	1	1	1	1	1	4
6. бетона, тыс. м³	—	1	1	1	1	1	4
7. стоимости, тыс. руб.	15	50	50	100	100	150	465
8. трудозатрат, чел.-дни	225	750	750	1500	1500	2250	6975
(9) *Фактические*							
(3) Объемы внедрения (количество опор)	—	—	—	—	—	—	—
(4) Экономия:							
5. металла, тыс. т	—	—	—	—	—	—	—
6. бетона, тыс. м³	—	—	—	—	—	—	—
7. стоимости, тыс. руб.	—	986,1	—	—	—	—	—
8. трудозатрат, чел.-дни	—	28 124	—	—	—	—	—
(10) Усредненные удельные показатели по снижению (на одну опору):							
7. стоимости, тыс. руб.		5					
8. трудозатрат, чел дни		75					

Key: 1. Stages in the development;
2. Planned (projected);
3. Scope of the implementation (number of supports);
4. Savings;
5. In metal, thousands of tons;
6. In concrete, thousands of m^3;
7. Of cost, thousands of rubles;
8. In labor expenditures, man-days;
9. Actual;
10. Averaged specific indicators for the reduction in the following (per support):.

Reference Information Data

1. Project planning:
--Tasking for the project planning;

--Engineering proposal;
--Engineering draft plan;
--Working drawings;
--Correction of the working drawings.

2. Trial fabrication;

3. Testing;

4. Industrial introduction;

5. Total expenditures for scientific research and project planning work;

6. Facilities where the cable protection is to be introduced:
   The Tara-Yekaterininskaya 110 KV VL [open wire power line];
   The Bryanskaya - Dormsh 110 KV VL;
   The Khor - Ptrovichi 110 KV VL;
   The Primorskaya GES - Bikin 110 KV VL;
   The Birobidzhan - Nayfel'd 110 KV VL;
   The Iman - Novopokrovka 110 KV VL;
   The Gryazi - Michurinsk 220 KV VL;
   The Lesozavodsk - Kentsukhe 220 KV VL;
   The Novovoronezhskaya AES - Novolipetskaya substation 500 KV VL;
   The Yermak - Rubtsovsk 500 KV VL;
   The Tselinograd - Yesil' - Sarbay 500 KV VL;
   The Yermakovskaya GRES - Ekibastuz - Temirtau 500 KV VL;
   The Yuzhno-Sakhalinskaya GRES - Pobedino 220 KV VL;
   The Festival'naya substation - Gomel' 110 KV VL;
   The Svetilovichi - Neglyubka 35 KV VL.

The divisions of the institute, having received the list, analyze it (drawing on the OKP [Unionwide Classifier of Industrial and agricultural products]) in scientific and engineering councils; they coordinate the engineering design solutions adopted for implementation in their own area of activity with the subcontractors (trusts), construction industry plants located in the given region, and the customer; they plan the preliminary facilities, as well as the scope and timeframes for the implementation. Based on the data of the preparatory materials, a calendar plan for the implementation of the new engineering design solutions is worked up in accordance with a definite form, where this plan is similar to the one cited above (see Form 1).

The production engineering department (PTO) of the institute simultaneously and in conjunction with Glavniiproyekt [Main Scientific Research Insitute for Project Planning] organizes the work with the main electrical power network construction administrations, the purpose of which is the specific linking of a particular engineering design solution (or several design solutions) to a particular coperforming trust for the implementation.

FORM 3

Форма

О Т Ч Е Т REPORT

(1) о внедрении новых технических решений в проекте ______

(отделение, ОКП)

Наименование нового технического решения (2)	Наименование традиционного технического решения (3)	Объем внедрения (4)	Экономия Savings							Примечание Notes
			[illegible] стали, тыс. т (5)	(12) бетона, м³			цемента, тыс. т (9)	капиталовложений, тыс. руб. (10)	трудозатрат, тыс. чел.-дней (11)	
				вибрированного	центрифугированного	монолитного				
				(6)	(7)	(8)				

Главный инженер проекта Chief Project Engineer

Key:
1. REPORT on the implementation of the new engineering design solutions in the project plan of: ______ (Division, OKP);
2. Designation of the new engineering design;
3. Designation of the traditional engineering design;
4. Implementation volume;
5. in steel, thousands of tons;
6. Vibrated;
7. Centrifugally cast;
8. Cast-in-situ;
9. in cement, thousands of tons;
10. in capital investments, thousands of rubles;
11. in labor outlays, thousands of man-days;
12. in concrete, in cubic meters:.

The engineering documentation for each new solution, recommended for implementation in the 11th Five-Year Plan, is prepared and issued as an individual volume (or issure), in which the following are included: a brief annotation, a review page; working drawing; area of application (graphs and selection tables); approximate volumes and the recommended conditions for introduction; comprehensive technical economic indicators for the new design and a comparison with the technical economic indicators for the design being replaced; a listing of recommended machines, mechanisms and technilogical accessories (technical documentation is provided for new accessories); recommendations for the organization of construction when the given engineering design solution is used; production process charts for the execution of the construction and installation work; the manufacturing volumes of the new structures (by years) with the indication of the manufacturing plant; and the results of full-scale tests and trial implementation.

The presence or absence of various sections of the engineering documentation is determined by the contents of the design solution itself. The "working drawing" section, incontrast to existing practice, will be drawn up in a differentiated fashion. Thus, working drawings will arrive at the manufacturing plants in the volume necessary for the fabrication of the structural design, and only the installation schematics will arrive at the construction and installation trusts.

The individual volumes (issues), which contain the new engineering design solutions, are sent only to those departments, trusts and power engineering systems following preliminary agreement, where the implementation of the given engineering design solution is reasonable and possible.

The organization of assistance and the monitoring of the implementation of the new engineering solutions, as well as the organization of the system of accounting and reporting on their introduction is assigned to the production engineering department of the institute.

A control card for the model being developed is filled out for each design solution (Form 2). Copies of the control cards are sent around to all of the specialist curators of the PTO [Production Engineering Departments] in accordance with the directives for their activity.

All of the departments of the institute will be given a sample report for the use of the new engineering design at the specific facility (Form 3), which the obligatory procedure requires to be incorporated in the complement of the project plan for the specific facility. Moreover, the departments of the institute should forward to the PTO the official documents on the implementation of the new engineering solutions twice annually (in January and July).

The data on the implementation of the new engineering solutions in the project plans for specific facilities, which come into the institute from the departments, and the indicators of the official documents for the implementation, are entered in the control cards.

The PTO specialist curators indicate all of the data characterizing the new engineering solutions utilized in the project plan in the copies of the control cards when rendering expert opinions, and also make recommendations for the application of new engineering solutions which are as yet not implemented. At the end of each month, information on the state of affairs goes to the PTO representative responsible for accounting for the implementation of the engineering solution.

The production engineering department of the institute assures the preparation of the reporting documents for Glavniiproyekt (in accordance with the existing procedure, once quarterly) concerning the course of the work to implement the new engineering solutions, and in February of each year, presents the management of the institute and Glavniiproyekt with an analytical review of the data on the direction of the activity of the department and the institute as a whole for the past year.

The monitoring of the implementation of the new engineering solution is removed in the case where the savings in capital investments (based on the data of the official implementation documents) exceeds the overall composite expenditures for the development (scientific research, testing and working up of the engineering documentation) of the new engineering solution by a factor of five.

The list of new engineering solutions approved by the management of the USSR Ministry of Energy will be incorporated in the bonus awards plan for new technology.

Some New Structural Design Solutions

Special foundations (to replace the mushroom shaped ones) have been developed for the VL [open power lines] and substations being built in fissured and broken rocky soils. Their erection technology is as follows.

A cement solution is poured in the holes previously drilled in the rock and rods of fittings of a periodic profile with a diameter of from 28 to 36 mm are inserted. The configuration of such foundations allows for the elimination of the explosives work and labor intensive operations of removing rocky soil from the excavation and refilling it with shipped-in soil. The proposed implementation volume is 1,000 km of Z1's; the savings in steel is 20,000 tons, and 13,000 m^2 of concrete; the reduction in capital investments amounts to 44,000 rubles and in labor expenditures, 40,000 man-days.

Surface foundations and foundations with a sliding shell (to replace the traditional pile foundations) have been designed for VL's and the ORU [open switchgear] of substations, being constructed on heaving soils. Two variants of surface foundations are proposed: with and without a support. Prefabricated steel reinforced concrete piles, cover plates or special beams can be used as the supporting portion. Foundations with a sliding shell take the form of piles (prismatic or cylindrical, with a diameter of 560 mm) with a metal jacket. The gap between the piles and the jacket is filled with a nonfreezing lubricant. The proposed implementation volume is 1,300 km of power lines; the savings in steel are 6,370 tons and 28,600 m^3 of concrete; the reduction in capital investments is by 5,850,000 rubles and labor expenditures are reduced by 81,900 man-days.

Foundations buried to a shallow depth (to replace the deeply buried, mushroom shaped ones) are proposed for beneath support posts which are guyed for 500 KV power lines. They take the form of a steel reinforced concrete structure (with a low reinforcing steel content) having a truncated pyramidal shape with a weight of about one ton. The proposed implementation volume is 1,010 km of power lines; the savings in steel are 700 tons, and the concrete savings are 2,400 m^3; capital investments are reduced by 454,500 rubles and labor expenditures by 16,200 man-days.

Floating foundation structures have been designed for the installation of supports in swamps, where the use of surface foundations is difficult. A floating foundation takes the form of a raft of metal floats with a cylindrical shape, which are joined together by a rigid framework. The floats (there are usually three of them) are joined into a single structure by means of grillwork made of beams. It was assumed in the determination of the effectiveness of the use of floating foundations that the installation of one such foundation will make it possible to reduce the length of a power line by one kilometer (the swamp bypass). The proposed implementation volume is 15 supports; the concrete savings are 200 m^3; capital investments are reduced by 76,500 rubles and labor expenditures by 14,250 man-days.

To secure supports with guys in soils which are not rocky and not frozen, screw type foundations are proposed in the form of single blade and multiblade anchors, while for t-e erection of power lines and substations under conditions of soils frozen for several years, they are proposed in the form of worm type piles. All of the screw structures are turned into the ground (twisted in) by means of special mechanisms. The proposed implementation volume is 2,200 km of power lines; the concrete savings are 32,800 m^3; the reduction in the volume of earthworks is 150,000 m^3; capital investments are reduced by 3,000,000 rubles and labor expenditures by 50,000 man-days.

Steel reinforced concrete supports based on posts with a diameter of 800 mm can be used as the corner anchor and intermediate corner supports on 220 - - 330 KV power lines. The production mastery of steel reinforced concrete,

centrifugally cast posts with a diameter of 800 mm makes it possible to dispense with metal supports and develop a unified construction technology for power lines. The proposed implementation volume is 9,500 posts; the steel savings are 49,200 tons and the concrete savings are 15,300 m^3; the reduction in capital investments is 10,720,000 rubles and labor expenditures are reduced by 38,000 man-days.

It is recommended that steel reinforced concrete supports based on centrifugally cast posts using a polymer cement base be installed in the regions of the far north (to replace metal ones) where the outside air design temperature is -40° C, as well as in regions with an elevated corrosiveness of the environment. The proposed implementation volume is 3,200 km of power lines; the savings in steel are 30,800 tons; the reduction in capital investments is 7,000,000 rubles and the labor expenditures are reduced by 9,600 man-days.

It is expedient to use steel reinforced concrete supports with centrifugally cast posts of high strength concretes (M600-M800) on 35 to 500 KV power lines. The posts are distinguished by a high freeze resistance and immunity to corrosion; they are fabricated from high strength concretes, because of which, favorable conditions are provided for the combined functioning of the fittings and concrete, and consequently, the deformation of the poles when flexed is reduced. The proposed implementation volume is 635,000 m^3; the savings in steel are 17,500 tons; capital investments are reduced by 2,640,000 rubles and labor expenditures by 3,500 man-days.

Steel reinforced supports with posts provided with class A-VI steel are likewise effective for 110 to 500 KV power lines. Because of the high strength characteristics of class A-VI reinforcing steel, the consumption of metal is curtailed and the post fabrication technology is simplified. The proposed implementation volume is 105,000 tons; the steel savings are 12,000 tons; capital invests are reduced by 2,580,000 rubles and lbaor expenditures by 20,000 man-days.

New gantry supports with lightened "equal resistance" crossarms have been designed for 330 to 500 KV power lines. Using them in place of the existing supports will permit a reduction in the weight of crossarms by 1 and 0.6 tons respectively for the 500 and 330 KV power lines. The proposed implementation volume is 3,900 supports; the steel savings are 3,500 tons, and the concrete savings are 11,700 m^3; capital investments are reduced by 4,440,000 rubles.

Corner ankor supports based on steel reinforced, centrifugally cast posts 650 mm in diameter (to replace the metal ones) are proposed for 110 to 330 KV power lines. The proposed implementation volume is 9,000 supports; the steel savings are 19,570 tons; capital investments are reduced by 7,380 rubles and labor expenditures by 171,000 man-days.

A free standing steel reinforced concrete gantry support based on posts with a diameter of 800 mm (to replace the gantry type metal supports using guys)has been designed for 750 KV power lines. The support takes the form of a free standing gantry with internal ties; the posts consist of two sections, each 20 m long with a diameter of 800 mm; the crossarm is metal. The proposed implementation volume is 500 km of power lines; capital investments are reduced by 1,600,000 rubles and labor expenditures by 20,000 man-days.

As is well known, conical posts 22 and 26 m long, with diameters of 560 and 650 mm in the base section, are used in the supports for 35 to 500 KV power lines.

To increase the turnover rate of the concrete casings at the plants, as well as to improve the providing of complete structural sets, posts are being developed which will be fabricated in a standardized sectional casing. The proposed implementation volume is 200,000 m^3, the steel savings are 25,000 tons; capital investments are reduced by 3,000,000 rubles and labor expenditures by 30,000 man-days.

An intermediate metal gantry support has been designed for 750 KV power lines. Because of the reduced slope of the support posts with respect to the horizontal (4:1 and 5:1 instead of 10:1), the change in the configuration of the crossarm and the improvement of the assemblies for coupling the crossarm to the posts, the stresses in the posts and guys have been significantly reduced, the horizontal dimension of the crossarm has been reduced, and consequently, the amount of steel used in the support has been reduced. The proposed implementation volume is 1,170 km power lines; the steel savings are 2,500 tons.

It is recommended that rigid buswork which is plant fabricated be used at substations. Open switchgear, 110 KV stations have been designed for six electrical circuit configurations.

Rigid buswork is used in conjunction with flexible buses; the line gantries are eliminated. All types of switches produced by the plants of the Ministry of the Electrical Power Engineering Industry can be used in the open switching stations. Aluminum alloy pipes are used for rigid buswork; the steel reinforced structures are series produced, and the metal structures (steel) are custom made. The proposed implementation volume is 300 pieces; the steel savings are 900 tons; concrete savings are 16,500 m^3; capital investments are reduced by 1.800,000 rubles; labor expenditures by 108,000 man-days.

The most effective engineering design solution developed by the Power Engineering Industry Administration, in cooperation with the Electrical Power Substation Construction trust and the Energoset'proyekt Institute are the substation buildings made of BMZ [not further defined] components (rapidly installed buildings). The proposed implementation

volume is 320,000 m^3; capital investments are reduced by 900,000 rubles and labor expenditures on an average of 60 percent as compared to traditional structural designs.

Work is continuing on the expansion of the applications area of UTB [not further defined]. As is well known, such blocks arrive at a construction site with the equipment installed. Their utilization allows for a reduction in labor expenditures in both the construction and the installation work. The implementation volume is 540 blocks; labor expenditures are reduced by 216,000 man-days.

Based on the preliminary figures, the realization of only 50 percent of the new engineering design solutions will permit a savings of 120,000 tons of metal and 120,000 m^3 of concrete; capital investments will be reduced by 100 million rubles and labor expenditures by 1,300 man-days. However, it is necessary to consider the fact that the successful resolution of the problem posed here depends on the persistence and goal directed efforts of the collectives of planning and construction organizations, as well as the plants of the construction industry of the USSR Ministry of Energy, which are working in this area.

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USE OF GLUE-BONDED WOOD FOR POWER LINE SUPPORTS

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 12, 1979 pp 24-27

[Article by V.V. Ovseyenko, engineer, and V.S. Sarychev, candidate of the engineering sciences]

[Text] The applications area of glue-bonded wood for the supports of high voltage electrical power transmission lines has been expanded in recent decades in a number of countries, something which is dictated by the need to reduce the consumption of metal, reduce the weight of the structures and the expenditures for their transportation, and to increase construction efficiency.

The situation in the U.S. is characteristic in this respect, where supports of glue-bonded wood are used along with steel supports. In 1960, an glue-bonded wooden support 35.5 meters high was installed at the Pitsfeld 750 KV test facility. After that, the 230 KV midpoint--Khant [sic] 30 km long was erected using П-shaped free standing supports made of glue-bonded wood. Supports with a height of 30 to 32 meters with storm guyed pole braces were designed for suspending two steel-aluminum wires with a cross-section of 363 mm^2 each per phase [1].

Only glue-bonded wooden supports were installed on the 345 KV Farrington to Salt Lake City power line (a length of 600 km). From 1965 to 1975, 2,754 km of 330-345 KV power lines were built on wooden supports. Glue-bonded wood was widely used in this case.

The following are provided when post type wooden poles are replaced by adhesive bonded supports:

--Complete industrialization of the fabrication of the individual components and the supports as a whole;

--Simplicity of assembly of the support at the survey markers and a reduction in labor outlays;

--An increase in the service life (the planks are dried down to a moisture content of no less than 15 percent prior to gluing, something which is dictated by the requirements of the technological process);

--The possibility of fabricating structures of the requisite dimensions and cross-sections in precise accordance with the distribution of stresses in the support;

--The utilization of short sized sawmill materials for long support components;

--Better conditions for the construction of dual circuit supports.

Work on the design of supports using glue-bonded wood was begun in our country in 1951 at Teploelektroproyekt [All-Union State Institute for the Design and Planning of Thermal Electric Power Stations], where structural designs were developed for the supports of 35 to 500 KV power lines. However, they did not find practical application.

The Ukrainian department of Energoset'proyekt [Power Network Planning and Design and Institute] began to work on this question in 1966, and in 1969, in conjunction with the Khar'kov Enegineering and Construction Institute, it worked out an engineering design, in accordance with which the working drawings of 110 KV support made of glue-bonded wood for suspending AS-120 wires in frost region II and wind region I were executed. Based on the configuration and overall dimensions, this support matched the standard single circuit steel reinforced concrete support for 110 KV power lines with a post 22.4 m high and a triangular arrangement of the wires. The design of the adhesive bonded support was based on the SN 11-57 and PP-V.4-62, PP-I.9.62 instruction.

In accordance with the distribution of the loads, the pole of the glue-bonded support had cross-sections of (from the top down): 300 x 360, 300 x 432 and 300 x 504 mm; it was put together from second grade pine boards, 45 mm thick, glued together in presses (with KB-3 glue). At the request of the plant, the pole was designed in two sections (18 and 4.1 m), where a special ring was made to join them together. The plant actually manufactured the pole from two sections 17 and 5.1 m long, with a cross-section of up to 250 x 432 mm, while the cross-section was increased up to the design value by a nail facing.

Following the fabrication of prototypes in the shop for glue-bonded wooden span support structures, in one of the plants of the Ministry for Motor Vehicle Road Construction of the RSFSR, the supports were tested at the test facility of the Soyuztekhenergo Production Association.

The results of the test confirmed the fact that the actual strength factors conformed to the design figures. To check the operational reliability, three glue-bonded supports (Figure 1) [not reproduced] were installed on one of the 110 KV power lines with steel reinforced concrete supports in the Khar'kov region (at a distance of 600 km from the manufacturing plant). The supports were delivered to the installation site

on a pole carrier for transporting steel reinforced concrete poles, and to the picket markers, on a motor vehicle with a trailer. The work process (assembly and installation of the support, as well as the rigging of the wires) is similar to the work process in the installation of steel reinforced concrete supports.

Thus, in 1970, an experimental section of glue-bonded supports was built in the electric power networks of the Khar'kov Power Administration on the existing 110 KV power line with steel reinforced concrete supports. The glue-bonded supports are in satisfactory condition after eight years of service on this section.

In 1973, after approval of the engineering design, working drawings of standard glue-bonded intermediate, free standing support poles for 110 KV (Figures 2,3) and 220 KV power lines were put out by the same department of Energoset'proyekt. The supports were designed for single circuit electrical power transmissions lines in icing regions I-IV and in wind region III. The following changes in PUE-66 were taken into account in the project planning:

--The smallest insulation spacings between current carrying and wooden components of the supports were taken from Table I-V-XII of these regulations, with the introduction of a coefficient of 0.9;

--The wind velocity pressure head with internal excess stresses was taken as equal to 10 percent of the maximal;

--Breakage of the cable at a tension equal to 0.5 T_{max}, and the holding action of the wires, were taken into account in the design calculations for the intermediate supports;

--The holding action of the cables in the case of wire breakage was taken into account;

--The standard tension with the breakage of a wire on supports with cables was taken to be the same as for rigid supports.

Figure 1. Intermediate experimental support for a 110 KV power line using glue-bonded wood. [not reproduced].

Supports of the KDP110-1* can be used in regions with level I pollution, while KDP220-1 supports can be used in regions with pollution levels I-II, based on the insullation spacings between the wires and components.

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*The support pole designation: K - glue-bonded; D - wooden; P - intermediate; 110 is the voltage and 1 is the type of support.

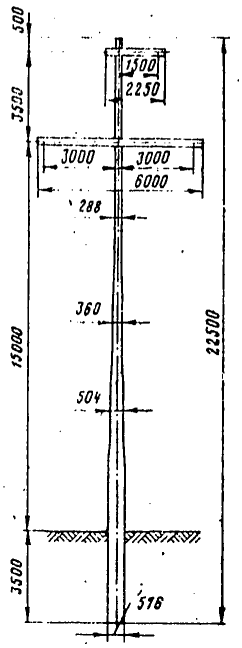

Figure 2. Standard intermediate single post support, KDP110-1, for 110 KV power lines.

The use of PS6-A insullators was provided for the power lines considered here: 7 units for 110 KV power lines in regions with pollution level I; and 10 units with pollution level II; for 220 KV power lines in regions with pollution levels I and II, the figures are 13 and 21 units respectively.

S-50 cables can be strung on the supports to protect against atmospheric overvoltages.

The tension in the 110 KV power lines is normal; and in the 220 KV power lines: normal in the ASO-300; in the ASO-400 and ASO-500, tension reduced down to the values of the tension in the ASO-300 wire. The clamps are dead-end clamps.

Provisions are made for installing the supports in drilled or dug excavations 3.5 m deep with- and without stayblocks (depending on the consistency of the soil).

The span lengths are given in Table 1.

Project plans for glue-bonded supports for a 35 KV power line section (with the possibility of changing over to 110 KV) in the Vinnitsa oblast (Figure 4)were likewise drawn up by Energoset'proyekt. The length of such a section with glue-bonded wooden supports is 10 km. The power line was placed in service in 1977. The length of a complete support pole, fabricated at the plant, amounted to 22 m. The order was fulfilled in excess of the plan; the wholesale factory price is 250 rubles/m^2.

At such prices, it is not economical to use supports of glue-bonded wood for 110 KV power lines, based on capital outlays, as compared to steel reinforced concrete and steel supports. At the same time, the prices in Price List 07-27 (wooden parts and structures) have not been established for the glue-bonded parts of the supports, since they have not been placed in mass production. The prices for regions I and II of the RSFSR have been established in Price List 02-27-1 for straight-line glue-bonded structures and components, which are close in their parameters to the parts of support poles (glue-bonded, single-slope beams for covers, beams for the span structures of bridges), and amount to 186 to 215 rubles/m^3. Consequently, it can be assumed without large errors that the price for glue-bonded parts of support poles will run 200 rubles/m^3.

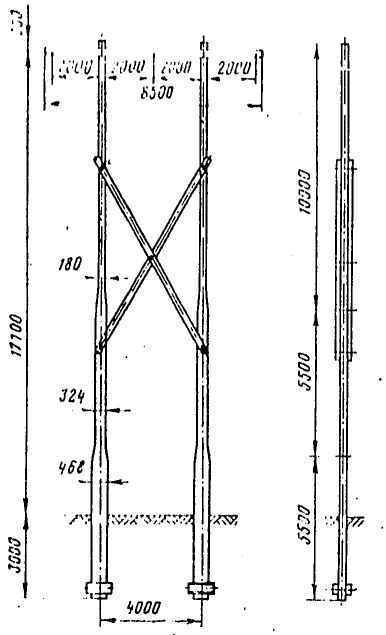

Figure 3. Standard intermediate gantry support made of glue bonded wood for 110 KV power lines.

As can be seen from the data of Table 2, at the adopted price level (200 rubles/$/m^3$), the per kilometer cost of 110 KV power lines (without taking into account the installation of the corner anchor supports) using glue-bonded and partially glue bonded wooden supports* is 11 to 25% less than the cost of power lines using steel supports.

Taking the installation of the corner anchor supports into account, the steel consumption per kilometer of 110 KV power line using steel supports will increase, based on approximate data, by 8 tons. In this case, the use of partially glue-bonded wooden supports will allow for an additional economic impact amounting to 900 rubles/km.

The economic indicators for glue-bonded wooden and steel reinforced concrete supports for 110 KV power lines are given in Table 3.

It can be seen from the data of Table 3 that the use of glue-bonded supports is efficient where the wholesale factory price for glue-bonded wood is 117 - 118 rubles/m^3. In this case, the savings in steel for a line section with only intermediate supports amounts to 2.6 t/km, and approximately 3.6 t/km taking into account the corner anchor supports.

An increase in the construction volumes of power lines with glue-bonded wood supports is planned for the immediate future: in the current five-year plan, the production volume of glue-bonded wood structures should be increased by approximately a factor of 6, and by 1980 will amount to 420,000 m^3. Provisions are being made in the long term for a further increase in the production volumes and the use of glue-bonded wood structures.

Figure 4. A section of 35 KV power line with glue-bonded wood supports [not reproduced].

As the results of research carried out at the NIIES, the Moscow Order of the Red Banner of Labor Civil Engineering Institute imeni V.V. Kuybyshev and

* Posts consisting of timbers, crossarms, and braces made of glue-bonded wood: this is the meaning of the numerical designation of the PDK110-3 support.

Table 1.

(a) Тип опор и марка проводов	(b) Длина пролетов (м) для климатических районов			
	I	II	III	IV
КДП110-1:				
АС-70	285/255	230/205	185/165	155/140
АС-95	300/285	250/225	205/185	175/155
КДП110-3				
АС-70	315/195	265/235	210/190	180/160
АС-95	350/310	285/250	235/210	200/180
АС-120	375/350	325/290	270/240	230/205
АС-150	375/350	340/305	290/260	250/225
КДП220-1				
АС-300	325	315	290	260
АС-400	360	325	290	260
АС-500	330	300	270	245

Notes: 1. In the numerator is the length of a span without a cable, and in the denominator, the length with a cable;
2. For the KDP220-1 support (type AS-300 wire), the span length with a cable is given.

Key: a. Type of supports and kind of wire;
b. Length of the spans (m) for the following climatic regions.

Table 2.

Indicators	Type of Support: P110-1N* (steel)	KDP110-1* (glued wood)	P110-3N** (steel)	PDK110-3** (partially glued wood)
Span length, m	305	250	365	255
Number of supports per km of power line, units	3	3.73	2.44	3.7
Materials used per support:				
steel, tons	1.87	-	2.44	-
reinforced concrete, m^3	2	-	2.6	-
beam crossarms, m^3	-	0.5	-	-
power system timber, m^3	-	-	-	2.1
glue-bonded wood, m^3	-	2.8	-	1.72
metal parts, tons	-	0.09	-	0.065
The cost per m^3 of glue-bonded wood, rubles	-	200	-	200
Capital investments per km of power line, thousands of rubles	3	2.311	3.194	2.01
Referenced expenditures per km of power line, thousands of rubles	0.456	0.411	0.475	0.357

* The calculations were performed for icing region II and wind region III, where AS-95 wire is strung; the cost of the wires and cable is not included in the capital investments (for wooden supports); the cost per m^3 of

[Notes to Table 2, continued]:

beam crossarms was taken as 70 rubles. The savings of materials per km of power line with the KDP-100-1 support were as follows: 5.6 t of steel, 6 m^3 of reinforced concrete and 401 kg of cable.

** The calculations were performed for icing region II and wind region III where AS-150 wire is strung; the cost of the wires, as well as the cable for PDK110-3 supports is not included in the capital investments, and the cost per m^3 of poles and scarfed foundation beams made of timbers was taken as 70 rubles. The savings of materials per km of power line with the PDK110-3 supports were as follows: 5.95 t of steel; 6.34 m^3 of reinforced concrete and 401 kg of cable.

Table 3.

Indicators	Type of Support: PB110-5 (reinforced concrete)	Type of Support: KDP110-5 (glue-bonded wood)
Span length, m	270	270
Number of supports per km of power line, units	3.7	3.7
Materials used per support:		
Fittings and built-in parts, kg	559.3	-
Concrete, m^3	1.87	-
Glue-bonded wood, m^3	-	4.2
Beam crossarms, m^3	-	0.13
Metal parts, tons	0.35	0.127
The cost per cubic meter of glued wood, rubles	-	117
Capital investments per kilometer of power line, thousands of rubles	2.265	2.206
Referenced expenditures per kilometer of power line, thousands of rubles	0.344	0.335

Notes: 1. The calculations were performed for icing region II and wind region III where AS-120 wires are strung; the cost of wires and insulation is not included in the capital investments per kilometer of power line, and the reduction in transport expenditures for shipping the glued supports is not taken into account; the outlays for cable and its installation when figuring the cost per kilometer of power line using glue-bonded wooden supports were not taken into account (in accordance with the PUE);
2. The savings in materials per kilometer of power line with KDP110-5 supports amounted to the following: 2.55 tons of steel, 6.7 m^3 of concrete and 400 kg of cable.

other organizations, the development of mass production of glue-bonded wood structures, the construction of shops incorporated in wood processing enterprises, outfitting them with production equipment of domestic manufacture, a growth in the level of production concentration and specialization as well as increasing the skill level of personnel will allow for a substantial reduction in the production cost of wooden structures, and consequently, the prices for them.

For straight adhesive bonded structures, the future production cost levels in regions with inexpensive sawmill materials can be taken at a level of 100-130 rubles/m^3, while the future price level can be 115-150 rubles/m^3. At this price level, one will be able to consider the question of the expdiency of increasing the construction volumes 35 - 220 KV power lines using wooden supports of glue-bonded wood instead of reinforced concrete supports [2].

In resolving the questions related to the construction of 35 - 220 KV power lines, the trend towards increasing consumption of steel in the line construction should also be taken into account (especially in industrial and municipal regions). The existence of various obstacles along a power line route requires the use of elevated steel supports, since the structural length of reinforced concrete supports is inadequate. The conditions for running the routes of these power lines are such that the number of corner anchor supports per km of power line is increasing sharply. While for 35 - - 110 KV power lines, an average of 0.2 - 0.3 supports were needed per km during 1969 - 1970, in 1976 - 1978, 0.6 were needed, and sometimes even for every support, i.e., only corner anchor supports are installed on some power line sections. Based on the data of a check of a number of 35 - 220 KV power lines using steel reinforced concrete supports, the steel consumption per km increased from 2 - 3 up to 6 - 8 tons, and for power lines using metal supports, by 20%. The construction cost also went up accordingly. For the same reasons, the length of these power lines (as compared to the straight-line air distance) increased an average of from 10 to 20%. The power line construction cost also increased. It is necessary to take into account the increase in steel demand where wood cannot be used because of inadequate mechanical strength.

All of this requires the acceleration of the resolution of questions concerning the use of glue-bonded wood, and pole timbers in conjunction with it, primarily for 35 - 220 KV power lines.

The state of the art allows for the design of glue-bonded supports with poles 30 to 50 m long. This will make it possible to dispense with the steel transition supports of the same height, and significantly curtail the consumption of steel and the capital investments. For example, when the standardized elevated steel U110-3N+14.5 support, 29 m high, is replaced by a glue bonded support of the same height, the savings in steel per support for a 110 KV power line will amount to 10 tons.

The installation of wooden supports made of glue-bonded wood (instead of steel ones) on only 10% of the 35 - 220 KV power lines will assure a steel savings over 5 years amounting to about 25,000 tons, and in this case, the construction costs will be reduced by approximately 10 million rubles.

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INSTALLATION OF ELECTRIC STATION GENERATOR EQUIPMENT

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 12, 1979 pp 30-34

[Article by V.Ya. Slagoda and Yu.M. Marder, engineers]

[Text] The project plan for the Severodvinskaya gas and fuel oil TETs-2 was executed by the Riga department of the Teploelektroproyekt [All-Union State Institute for the Design and Planning of Thermal Electric Power Stations]. A distinctive feature of the project plan is the combined main building (OGK), in which the chemical water purification, the reagent warehousing and scrubber facilities, the hot water boiler room and the central repair shops are located, along with the power units (Figure 1).

The electric power station is of a modular block design. The layout of the turbines is a transverse one.

The main steam line of the Severodvinskaya heat and electric power station is made from 15Kh1M1F steel, and the feed line from 15GS steel. Their configuration is a single line circuit. The exclusion of transverse steam and feed water lines between adjacent sets has made it possible to reduce the length of the piping and the quantity fittings, and lower the equipment cost.

Two bridge cranes with a lifting capacity of 50/10 tons each are installed in the turbine room, which service both the turbine room and the chemical water purification unit (KhVO). The area of the power generation and hot water boiler is serviced by two bridge cranes with a lifting capacity of 30/5 tons, and the smokestack room is serviced by one semi-gantry crane with a lifting capacity of 20 tons. Two electrical crane-beam hoists with a load lifting capacity of 5 tons each are installed in the deaerator room.

The electrical power station building is without a basement. The condensate floor of the turbine room and the floor of the boiler room are positioned at the zero level marker. The service deck of the turbines is located at the 12.00 m marker. In the auxiliary section, the hot water boilers are installed on metal structures with the upper mark at 8.50 m.

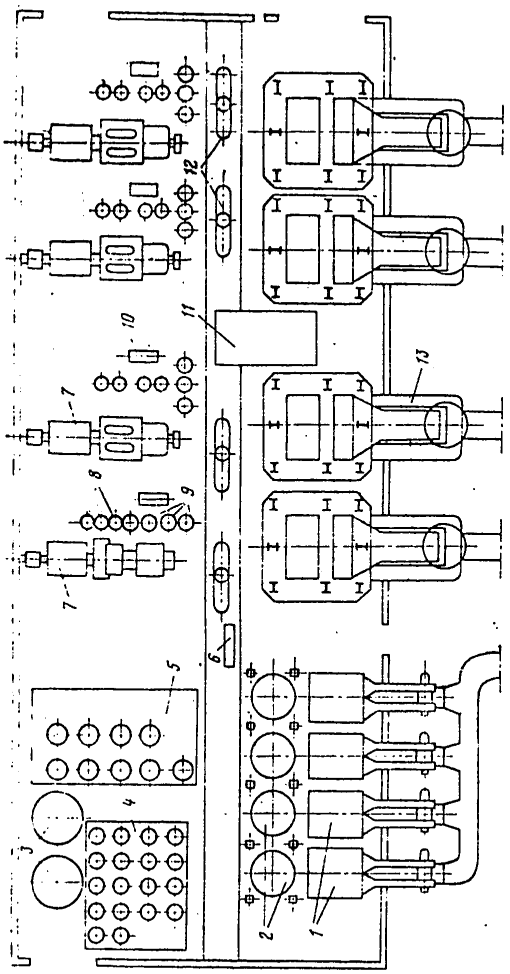

Figure 1. The equipment layout of the combined main building.

Key: 1. Hot water boiler; 2. Production process tank with a capacity of 400 m^3; 3. Filter; 4. Filter room 5. Warehouse for reagents; 6. BROU of the ROU-U-B-VAZ type [not further defined]; 7. Turbine set; 8. Low pressure heaters; 9. High pressure heaters; 10. Feed pump; 11. Block control panel; 12. Deaerator; 13. Steam boiler.

The chemical water purification facility of the TETs consists of the following installations: thermal desalinization; cleaning of the condensate returning from the fuel oil management unit; cleaning of the condensate returning from the steam users; make-up for the heating mains.

The fuel oil management unit consists of a standard intake and outlet unit, a two-stage fuel oil pump room, incorporated in the oil equipment room, three metal reservoirs and an oil storage room. The pump facility for liquid additives is located in the fuel oil pump room.

The area for unloading reagents, the compressor room, the electrolysis room and the warehousing rooms are located in the block for auxiliary services (BVS).

OPV-2-110-KE pumps are installed in the central pumping station (TsNS).

The conditions for the organization of series construction of heat and electric power stations were taken as the basis for the project plan of the Severodvinskaya TETs-2:

--Complete prefabrication of all of the buildings and structures (with the exception of the smokestack), taking into account the delivery to the construction site of consolidated installation blocks of structures which are in a state of complete plant readiness.

--A high level of plant readiness of the equipment, piping and their delivery in modular block units.

--Centralized repair of the equipment, and as a consequence, a reduction in the number and dimensions of the auxiliary services for the TETs.

The Kola, Kotlas and Ukhta installation sections were brought in to assist the Arkhangel'sk installation section of the Northwest Power Engineering Equipment Installation Trust with the installation of the thermomechanical equipment of the first power unit. The Arkhangel'sk installation section was the general contractor, who performed the bulk of the work. The Kola section had an independent agreement with the construction administration of the Severodvinskaya TETs-2. The Ukhta and Kotlas installation sections were subcontractors of the Arkhangel'sk section.

The work volumes were distributed among the participants in the following manner: the installation of the equipment and the piping of the deaerator level was performed by the Kola installation section; the equipment, metal structures and piping of the auxiliary section of the turbine room of the OGK were installed by the Ukhta section.

An assembly site with dimensions of 42 x 400 m with entrance rail tracks into the turbine room and the boiler room was constructed on the territory of the construction base to perform the assembly and consolidation work, and to store the equipment. Moreover, the site had an exit to row G (railroad

entrance on centerlines 1 - 2) via the railroad tracks of the construction base. The railroad track to the smokestack room, which was incorporated in the project plan by the Orgenergostroy institute, was constructed for the second power unit of the TETs.

A provision was made in the project plan for work performance at the assembly site for the installation of two gantry cranes with a lift capacity of 50/10 tons each, having a span of 42 m. However, only one crane was allocated. Because of this, the section had to install a gantry crane with a lift capacity of 30 tons and a span of 32 m, which was removed from the assembly site of the Arkhangel'sk TETs, something which led to a significant reduction in the useful area.

The set of temporary structures provided in the PPR was built by the section during the process of preparing for the full volume of installation work.

An oxygen and gas supply station, consisting of 8G-513 tanks for storing liquid oxygen, as well as a stock oxygen distribution station (IKRU-80), recipient and gas supply (AGU-2M) installations, were constructed to provide the welding operations with oxygen. Oxygen was delivered to the work sites at the assembly area and to the OGK in a centralized manner. Propane and butane were supplied separately for the OGK and the assembly site. Each of the systems consisted of a distribution layout (for 15 tanks) and a gas circuit. Moreover, centralized power distribution layouts for electrical tools and welding equipment were built on the site and in the main building.

During the preparation period for the construction work, engineering and technical workers traveled to the Rostov TETs-2 for the purpose of studying the installation experience. Representatives of the Arkhangel'sk installation section repeatedly visited planning organizations (the Riga branch of TEP, Energomontazhproyekt) where they became acquainted with the engineering documentations, the breadboard model of the OGK and resolved some questions concerning the development of the PPR. The work volumes and labor outlays were determined, and schedules were drawn up for providing personnel, mechanisms, tools and materials.

It is essential to note that the engineering developmental work was made more difficult by the untimely (with a considerable delay) issuance of the project plan estimates.

Because of the curtailed directive deadlines for the installation of power unit No 1, organizational and engineering measures were worked out for the installation of the hot water boiler and the power unit itself, which provided for the following:

--Speeding up the delivery of bridge cranes and other load lifting mechanisms;

--Strict observance of the production sequence for the installation of the fuel oil management equipment, the exterior scaffolding, the industrial water supply system, the equipment and piping of the auxiliary section of the OGK and the electrical equipment;

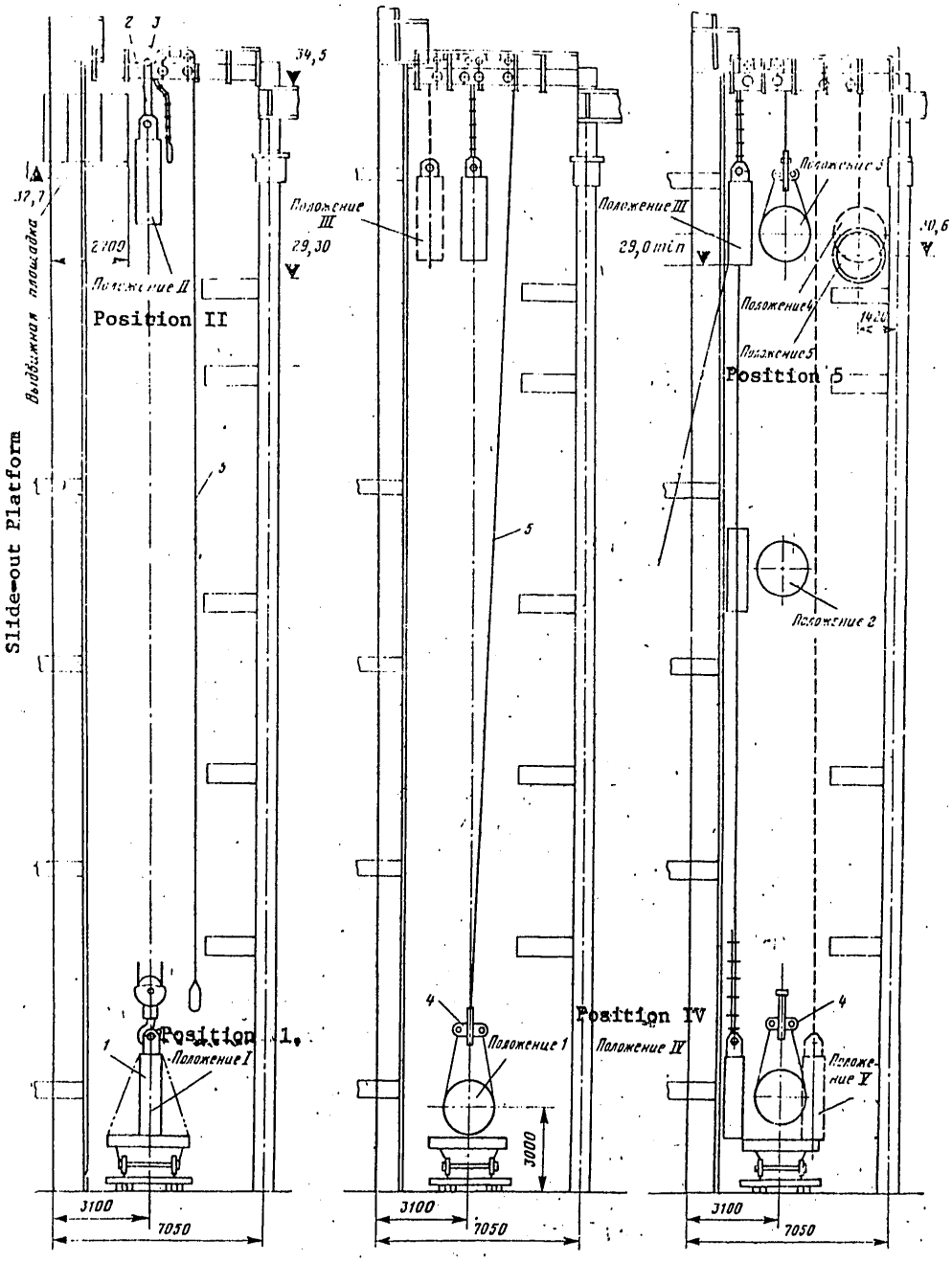

Figure 2. Hoisting a boiler drum with two cranes using a counterweight.

--The installation of the deaerators, exhaust piping, warehouse tanks for the storage of reagents and the main piping of the deaerator level using construction cranes;

--Strict observance of the KVOiT delivery schedule [KVOiT not further defined];

--Drum hoisting by means of a counterweight, the installation of a tank with a capacity of 20,000 m^3 using one DEK-25 crane and the KhVO filters in consolidated blocks;

--The block installation of the general station equipment and piping.

An important component of the preliminary engineering work was the development of a consolidated production schedule for the installation work for all of the facilities of the project underway. The schedule was drawn up on the basis of data received from the general contractor concerning construction readiness, as well as the deliveries of main and auxiliary equipment, piping and metal structures. It was ascertained in working up the schedule that in accordance with the planned production sequence for the execution of the installation work, the following were necessary: have the assembly site ready for receiving equipment at the start of the year; accelerate the timeframes for the delivery of the bridge cranes, and receive the planning estimates on time.

The resolution of these questions and the implementation of the planned organizational and engineering measures made it possible to organize a clear-cut work cycle and curtail labor expenditures in the installation work by 2,300 man-days.

A temporary attachment (bridge) with a slide assembly was used to hoist the drum with a weight of 98 tons using two bridge cranes with a hoist capacity of 30 tons each by means of a counterweight with a lift capacity of 40 tons; this temporary attachment was installed on the column of row C of the building and the frontal column of the boiler framework at the 34.50 m mark (Figure 2).

The counterweight 1 with a lift capacity of 40 tons is set in position I on the rail platform, slung on the hooks of the two bridge cranes, with a load capacity of 30 tons each, hoisted to position II and suspended by cable 2 on bridge beam 3 at the 34.50 m mark. Removing the load from the cranes without unslinging the hooks assured the safe performance of the work when rigging the boiler drum.

The drum with crossarm 4, having a load capacity of 100 tons, secured to it, was placed in position 1. The loop of the pulling cable was secured to the crossarm. Then the counterweight was lifted by the bridge cranes by 100 - 200 m, cable 2 was removed, and in its place, the ends of the pulling cable 5 were slung and secured, after which the counterweight was lowered and the load was shifted from it to the pulling cable. The bottom of the counterweight should be no lower than the 29.00 m mark.

The hooks of the cranes were removed from the counterweight by previously installed guy lines.

Using conventional lifting jacks, the slide block assembly with the counterweight was shifted to position III. After this, the boiler drum was slung on the hooks of the bridge crane and lifted through intermediate position 2 to position 3, and the counterweight was at this time lowered to position IV. Then the drum and the counterweight were shifted to positions 4 and V respectively.

Following the setting of the drum in the planned position 5, the counterweight is lowered to the platform, the tackle rigging is removed along with the crossarm and pulling cable, and the temporary bridge with the slide block is dismantled.

The installation of the drum using a counterweight has made it possible to significantly reduce the labor expenditures for the installation of additional tackle accessories, installation rigging for hoists and blocks, as well as reduce the consumption of pulling cable and metal in the fabrication of the temporary accessories.

A special attachment (Figure 3) was used for the installation of the 20,000 m^3 capacity tanks by means of one crane with a load capacity of 25 tons. A marking line was made at the bottom end of the roll at a height equal to the height of the attachment (about 4,000 mm), and then a crane with a hoisting capacity of 25 tons with a boom 14 m long lifted the lower end of the roll up and the attachment was pushed under it to the marking line by a bulldozer.

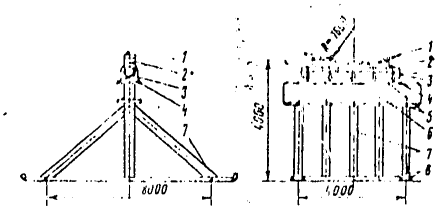

Figure 3. The installation of tanks using one crane by means of a special attachment.

Key: 1. Saddle;
2. Rib;
3. Rotating tube;
4. Guide supports;
5. Sheet liner;
6. Bed frame made of No 40 I-beams;
7. Posts made of pipes with dimensions of 273 x 7;
8. Base made of No 30 channels.

The roll was lowered on the saddle of a rotating tube and secured to it at a weld using gusset plates to avoid slipping when the upper end of the roll is lifted. Then the upper end was lifted by the same crane, having boom 18 m long.

When the upper end of the boom is lifted, the pipe rotates on its axis, and as a result, two forces are produced (counterweight), one of which acts downward (the bottom end of the roll), while the other acts upward (the upper end of the roll, being lifted by the crane), and thereby, the load is easily placed in a vertical position. After this, the gusset plates were cut off and the attachment was removed from the bottom of the tank.

This method of tipping tank rolls 12 m high and weighing up to 55 tons using one DEK-25 crane is rather simple and does not require large labor outlays for preparatory work.

The accessory can be used for the installation of several tanks at one facility; it is shipped to another facility using a conventional trailer.

In analyzing the course of the installation work, based on the measures which were planned, the following must be noted.

Advanced installation work was not successfully realized in the full volume with respect to the fuel oil management facility because of delays (of three months) in the deliveries of piping for the fuel oil pump room and framing; also, as regards the chemical water purification and hot water boiler room, because of the late delivery (in April - May) of the pipes by the KVOiT plant, as well as late delivery of the bridge cranes.

During the erection of the main building, the construction crane was also not used to install such equipment as the outlet and mains piping, and the tanks for the storage of reagents. The reason for this was the late delivery of the indicated equipment by the Ivangorod plant. To install the warehouse storage tanks for the reagents, it was necessary to dismantly the decking at the 12.00 and 7.00 m marks, and drag the tanks into the installation position with winches.

The measures to raise the tank using a counterweight and install the tank with a capacity of 20,000 m^3 using a single crane were sucessfully and fully implemented.

A provision was made to assure the major reduction in labor outlays (by 1,600 man-days) through the installation of large units, fabricated at the Ivangorod KVOiT plant.

Some three types of piping block units were to have been fabricated: comprehensive, packaged and individual.

The comprehensive units included the equipment and piping delivered by various plants. The major portion of the low pressure piping was supplied by the Ivangorod KVOiT plant, while the equipment (heat exchangers, pumps) was supplied, as a rule, by the plants of other ministries.

The packaged units included only the piping and metal structures basically supplied by the Ivangorod plant. Of the overall amount of packaged units

provided in the project plan, only about 50% were fabricated and delivered. However, these units too were not supplied on time and in complete sets. For this reason, it was necessary to do a considerable volume of additional work during the installation, which was related to the elimination of defects, and incomplete sets of supplied materials. In a number of cases, because of the untimely delivery, it was necessary to take apart a portion of the packaged units to provide for the planned installation process. Moreover, because of disruptions in the delivery of the units, the accomplishment of the bulk of the installation work was shifted over to the starting period, something which led to an increase in the number of workers, and caused difficulties in providing them with living quarters as well as tools and small machines.

As a result of performing the installation work within the reduced timeframes, the section nonetheless succeeded in achieving the planned reduction in labor expenditures.

Conclusions

1. The project plan for the Severodvinskaya TETs-2 can be considered the future plan as regards the assurance of minimum labor outlays for the installation of the thermomechanical equipment. The new project design solutions worked out for the modularizing of the auxiliary facilities of the TETs and the modular installation make it possible to achieve a significant reduction in the labor intensity and shortening of the time for the installation work.

2. The following are needed to further refine the organization of installation work at series produced heat and electric power stations with an increased level of plant readiness:

--The engineering documents should be issued by the engineering organizations no later than September 1st of the year before the start;

--Orders should be placed at the plants of the Thermal Power Engineering Equipment Trust and the schedules for the deliveries coordinated with them no later than December 1st of the year before the start;

--The project planning organization should work up the plan for putting the materials and equipment together and coordinate it with the supplying plants prior to the construction start;

--The PPR is to be issued no later than January 1st of the start year;

--The POS is to be worked out with the participation of representatives of the Power Engineering Installation Planning Administration institute and installation organizations to incorporate in the construction work production schedule those processes performed by the installation organization using load hoisting construction mechanisms;

--Provide for advanced delivery of equipment included in comprehensive unit packages, either to the plants or the bases which fabricate these units;

--Strict adherence to the delivery schedules for the equipment and piping by the plants of the Thermal Power Engineering Equipment Trust and the application of stringent economic sanctions in the case of failure to observe their deadlines or completeness of the deliveries;

--The manufacturing plants are to assure 100% readiness of the units (including hydraulic testing and test assembly of units which are to be joined together).

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SOME PROGRESSIVE ENGINEERING DESIGNS FOR 500 KV SUBSTATIONS

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 12, 1979 pp 39-42

[Article by B.S. Shevchenko and V.F. Skorkin, engineers]

[Text] The increasing construction volumes of 35 KV and higher substations require searching for new designs, efficient methods of labor organization, the introduction of progressive structural designs and materials, the refinement of construction and installation work procedures and their further comprehensive mechanization. In this case, it is essential to devote particular attention to large substations, since the duration and cost of their construction remain high at the present time.

We shall analyze the experience with the construction of the Chimkentskaya, Andizhanskaya and Guzarskaya 500 KV substations, the plans for which were executed by the SAO of the Energoset'proyekt [Power Network Planning Institute], while the construction was carried out by mechanized column No. 49 of the Central Asian Electric Power Network Construction Administration Trust.

Engineering designs and structures, which were improved taking into account the experience with the construction of the first two substations were used in the construction of the Guzarskaya 500 KV substation:

--Drilled and built-in-place piles used as foundations under the cellular bus type and line portals of the 220 and 500 KV ORU's [open bus-and-switch structures] and individual, free standing lightning arresters;

--USO [not further defined] posts under equipment, installed in drilled-out holes with diameters of 0.4 and 0.65 m, with the recesses filled with a mixture of concrete or gravel and sand;

--Drilled and built-in-place piles, joined together by grillwork, used as foundations under reactors;

--Drilled and built-in-place piles under the guys of 220 KV portals, instead of anchor plates;

--A net type enclosure of simplified structural design to replace a reinforced concrete one;

--The elimination of towers for transformer inspection, and a reduction in the length of roll paths;

--Replacement of the combined metal transformer 220 KV portal with a steel reinforced concrete line type;

--Dispensing with the use of AR-4 collar beams to secure the reinforced concrete posts of 110 and 220 KV portals in the ground, by burying the latter deeper in drilled-out holes with subsequent filling of the recesses with a concrete mixture;

--The introduction of a simplified structural design for fire protection barriers of SN-220 posts and DP-6 paving slabs, as well as replacing the standard guys of a 500 KV cellular portal with guys made of two twisted cables 22.5 mm in diameter without an equalizer.

The introduction of the complex of indicated measures will permit a reduction in the construction cost of a substation by 364,000 rubles and curtail the time for the construction by 3 months.

Taking into account the construction experience with the first two 500 KV substations (the Chimkentskaya and Andizhanskaya), methods were also refined for the organization of labor and its management; the starting configuration and the technological sequence for the execution of the individual types of work were clearly defined. Prior to the construction start, a complex of preparatory work was carried out: a residential settlement, approach road, warehouses and a concrete mixing plant were built, and the project was provided with a sufficient amount of material and technical resources.

Additionally, a calendar schedule was developed for the performance of the individual kinds of work, expressed in physical and cost terms, with a breakdown by months. In accordance with the production schedule for the construction, the scheduling chart for material and technical supply, coordinated with the supply plants, was drawn up on a monthly basis.

All of the construction and installation work was performed using internal work flows. In this case, the specialization of the brigades and teams did not preclude their interchangeability.

A permanent staff was organized for the operational management of the construction of the substation and the coordination of the work performed by various construction and installation organizations.

Comprehensive mechanization was widely used in substation construction, including small mechanization tools:

--Various grapples for precise setting of the USO posts, the DP-6 slabs, trays and slabs prior to assembly;

--A closed type transporter for feeding cement and a mixture of gravel and sand to a concrete mixer;

--An IV-21 electrical vibration compactor to remove defects in the concrete mixture from the cab of a dumptruck and a dosing device;

--A DT-500 welding transformer, mounted on a TK-53A tractor crane;

--An induction manifold on a motor vehicle for pumping water into a tank;

--An MKG-25 crane for installing portals in a functioning substation.

We shall consider the expediency of using drilled and built in place piles using the example of the construction of the 500 KV Andizhanskaya substation. The main engineering indicators of the various structures of this substation are given in Table 1.

The utilization of drilled and built in place piles instead of prefabricated reinforced concrete foundations has allowed for a reduction in the cost of the construction of the Andizhanskaya substation, a curtailing of the labor expenditures for its construction (Table 2), and also made it possible to simultaneously perform various coordinated work operations on the construction site.

The following efficient work procedures were also utilized in the construction of the substation considered here:

--The installation of USO posts underneath equipment by means of containers;

--The use of templates for the precise positioning of the anchor bolts of drilled and built in place piles;

--The layout of the drilling sites of the cylindrical holes underneath the drilled and built in place piles and the USO posts using stock templates;

--An excavation device for coarse gravel soils using MRK type machines, equipped with a special drilling head with changeable bits;

--The preparation of commercial concrete of the requisite consistency in advanced concrete plants;

--The use of a clayey solution when drilling holes in sandy soils;

--The introduction of a metal slip form for filling the metal components of a fire protective barrier with concrete;

TABLE 1

Indicator	1.	2. ОРУ 220 кВ	3.	4.	5.
6. Объем сборного железобетона, м³	317,2/821	217,7/524,2	32,2/232,7	–/60	25,5/35,7
7. Объем монолитного бетона, м³	9,7/1134	283,1/7,1	231,6/1,5	84/—	–/0,9
8. Масса стальной арматуры, т	25,2/—	11,3/—	13,1/—	4,1/—	—
9. Расход анкерных болтов, т	4,1/—	4,1/—	2,3/—	0,6/—	—
10. Объем щебня, м³	90/—	127,6/—	33,2/—	—	29,5/—
11. Площадь гидроизоляции, м²	300/3464	1130/3030	306/2130	–/760	[illegible]
12. Объем земляных работ, м³	2343/31166	870/11570	609/7935	91/701	127/[illegible]

Примечание. В числителе даны показатели по сооружениям с фундаментами из буронабивных свай, в знаменателе — со сборными железобетонными фундаментами.

Note: The numerator shows the indicators for structures with foundations made of drilled and built-in-place piles, while the denominator shows those for prefabricated, reinforced concrete foundations.

Key:
1. 500 KV ORU [open bus-and-switch structure];
2. 220 KV ORU;
3. Transformer assembly;
4. Lightening arresters;
5. Personnel protection;
6. Volume of prefabricated reinforced concrete, m^3;
7. Volume of cast-in-situ concrete, m^3;
8. Weight of steel fittings, tons;
9. Amount of anchor bolts used, tons;
10. Volume of crushed stone, m^3;
11. Waterproofing, m^2;
12. Volume of earthwork, m^3.

TABLE 2

Indicators Показатели	1. ОРУ 500 кВ	2. ОРУ 220 кВ	3. Трансформаторный узел	4. Молниеотводы	5. Грозащита
6. Стоимость строительства, руб.	69456/142252	43027/83844	16013/41538	928/8660	4318/744
7. Трудозатраты, чел.-дни	1444/2214	1058/1564	398/652	52,1/109	116/157
8. Ежемесячная выработка на одного работающего, руб.	2016/1316	1658/1125	2192/1340	3570/1710	1347/995
9. Затраты машинного времени, машино-смены	456/803	222/576	105/216	19/30	20/63

Примечание. В числителе даны показатели по сооружениям с фундаментами из буронабивных свай, в знаменателе — со сборными железобетонными фундаментами.

Note: The indicators for structures with foundations made of drilled and built-in-place piles are given in the numerator, and the figures for prefabricated reiforced concrete foundations are given in the denominator.

Key:
1. 500 KV ORU [500 kilovolt open bus-and-switch];
2. 220 KV ORU;
3. Transformer assembly;
4. Lightening arrestors;
5. Personnel protection;
6. Construction costs, rubles;
7. Labor expenditures, man-days;
8. Monthly output per worker, rubles;
9. Machine time outlays, machine-shifts.

--The use of the side surface of reinforced concrete trays as the form underneath the foundations of buildings;

--The use of electric nut wrenches and painting units when assembling and painting the portals on test sites;

--Securing the guys of portals by means of the TK-53A tractor crane.

[Photo not reproduced.]

Figure 1. The use of stock templates for laying out the centers beneath drilled and built-in-place piles.

The implementation of the measures indicated here has allowed for an improvement in work quality and an increase in labor productivity by 12 percent.

The construction work at 220 and 500 KV ORU's was performed by one brigade, which worked on the basis of brigade subcontracting. Specialized teams were set up to perform individual kinds of work.

[Photo not reproduced.]

Figure 2. The use of a metal pan to load earth.

The team for marking out the drilling sites under the drilled and built-in-place piles and the USO posts consisted of three persons: a category 6 geodesic surveyor and two category 3 power lineman. Prior to the start of the layout, the vertical planning was completed for the 220 and 500 KV ORU sites using stock templates: the layout of the centers for the piles and the groups of USO posts (Figure 1). The correctness of the positioning of the templates was checked by means of axial extensions.

The team which handled the excavation unit consisted of four persons (two category 3 power linemen and two machine operators). The holes were drilled to a depth of down to 5.5 m by the MRK-3A machines, which were equipped

[Photo not reproduced.]

Figure 3. The installation of posts on a concrete base using the cassette method.

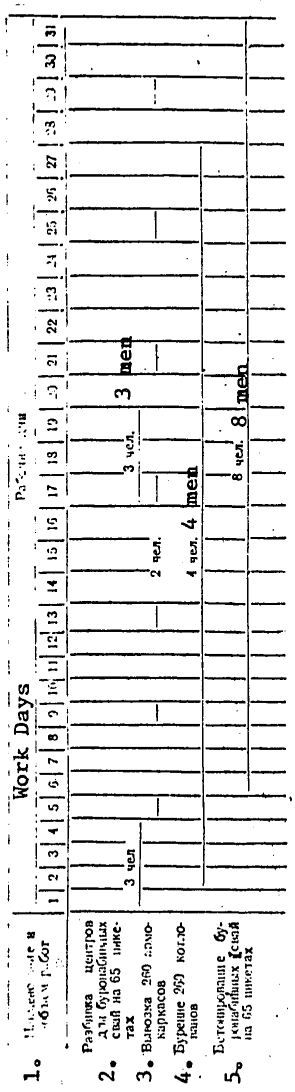
with screw worms 650 and 400 mm in diameter. The earth was loaded into a metal tray (Figure 2) and then loaded in a dump truck and hauled to a dump. Such a work procedure precluded the later necessity of manually grading the ORU site.

The team for setting up the drilled and built-in-place piles consisted of eight persons: a category 6 truck crane operator, a category 4 electrician, three category 3 power linemen and one category 5 lineman, as well as two dump truck drivers.

The reinforcing casings for the survey points were brought out by a tractor trailer T-75 crane and stored on the site of their installation. Prior to installing the reinforcing casings, the depth of the cylindrical holes was checked; the bottom of the holes was carefully tamped by hand. The reinforcing casings, positioned at a height of 100 to 150 mm from the bottom of the hole, were clamped by metal pins. Then the template was installed and the height of the reinforcing casings was checked with a level. The axes of the templates were oriented along the extensions.

The concrete mixture which was delivered by two MMZ-555 dump trucks was poured in layers with a thickness of no more than 1.25 times the length of the working portion of the IV-47 deep vibration jigger. A local platform vibrator was mounted under the dump body of each dump truck, something which promoted its unimpeded unloading. A dismantlable metal form was used to form the pedestal portion of the drilled and built-in-place piles. The depth and surface vibrators were powered from transformers, mounted on a twin shaft trailer. The template protected the threads of the anchor bolts against fouling by the concrete.

TABLE 3.



Key: 1. Designation and volume of work;
2. Layout of the centers for drilled and built-in-place piles at 65 survey points;
3. Removal of 260 reinforcing casings;
4. Drilling 260 holes;
5. Pouring the concrete for drilled and built-in-place piles at 65 survey points.

The team for the installation of the poles of the supports under the equip- consisted of four people (a category 5 truck crane operator, two category 3 power linemen and one category 5 lineman). The USO posts were installed in the drilled holes on a concrete or gravel base. The recesses were filled with concrete or a gravel and sand mixture.

When installing the posts on a concrete base, it proved to be efficient to use a cassette method, in which case, the simultaneous installation of two to four posts (Figure 3) was assured by their precise positioning in both the vertical and plan views.

The posts were installed on the pebble base in order by the crane, checked for height and vertical alignment, and wedged in the hole. After the installation of 10 to 20 posts, the recesses were filled with concrete or a gravel and sand mixture, depending on the finishing process.

The work performance schedule for the installation of the drilled and built-in-place piles under the bus portals of a 500 KV ORU is shown in Table 3.

As can be seen from the schedule (Table 3), the overall labor expenditures for the installation of the drilled and built-in-place piles amounted to 347 man-days, instead of the 705 according to the norms.

Thus, the introduction of drilled and built-in-place piles, as well as progressive methods of the organization and execution of the work considered here for the construction of large substations, permits a reduction by a factor of 1.3 in the time needed for foundation construction, halves the cost of construction and increases labor productivity by a factor of 1.5.

8225
CSO:1822

ELECTRIC POWER

GAS INSULATED EQUIPMENT IN CUBICLE SWITCHGEAR SUBSTATIONS

Moscow ENERGETICHESKOYE STROITEL'STVO in Russian No 12, 1979 pp 78-79

[Article by T.S. Burukhina, engineer]

[Text] As is well known, the growth in the demand for electrical power by industrial enterprises, especially ferrous and nonferrous metallurgy, chemistry and petrochemistry, the operation of which is related to the pollution of the atmosphere, has been noted at the present time in large cities. Because of this, such problems as significantly reducing the area taken up by substations and providing reliable protection of substation equipment against the harmful action of the environment are the most urgent ones.

The most efficient solution of this problem, as practice has shown, is the construction of deep entrance substations, which receive the electric power via open wire and cable lines at 110 and 220 KV, as well as the use of gas insulated cubicle switchgear (KRUE).

The following are to be numbered among the advantages of KRUE's over traditional switchgear:

--A reduction in the labor intensity of the construction and installation work when erecting the substations, averaging 20% by virtue of the reduction in the area and volume of the cubicle switchgear.

--A reduction in the time required for electrical equipment installation work by about 40 - 80% by virtue of providing for equipment deliveries in large modular units.

--An improvement in the operating conditions: servicing safety, an increase in the period between repairs, quiet operation of the switches, fire safety, the possibility of longitudinal, transverse or combination arrangements of the phases, as well as horizontal or vertical mounting of a switch.

During the construction of the 220 KV Yelokhovskaya enclosed substation in Moscow, 110 and 220 KV elemental gas insulated cells produced by the Elektroapparat scientific production association were installed and had

power applied for the first time in domestic practice. Gas insulated 110 and 220 KV cells, supplied by the Swiss VVS company, were installed at the Sviblovskaya 220 KV enclosed substation.

The 110 and 220 KV KRUE's were installed in one room, covered with trusses having a span of 30 m (the PK-01-133 series) to produce optimal operating conditions at the Yelokhovskaya and Sviblovskaya substations. The 10 [sic] and 220 KV power line entrances of the Sviblovskaya substations and the autotransformers were connected to the KRUE cells by gas insulated current conductors through feedthrough insulators, and the cable lines were connected to the KRUE cells by insulating gas--oil cable entrances.

It must be noted that the area occupied by the first cellular switchgear 220 KV Paveletskaya substation, in which open installation equipment was used, is 1.8 ha. The area taken up by the Yelokhovskaya and the Sviblovskaya substations is 0.95 and 0.7 ha respectively. At the same time, the structural volume of the building for the Paveletskaya substation amounts to 100,000 m^3, it is 53,000 m^3 each for the Yelokhovskaya and Sviblovskaya substations.

It was ascertained that the use of gas insulated conductors in the switchgear alone with conventional equipment makes it possible to substantially reduce the area occupied by a substation, while the use of more efficient KRUE layouts, permits a reduction in building volume by a factor of 1.5 - 2.

The major directions for further refining the design planning and construction of deep entrance substations (reducing the size, weight and cost of domestic gas insulated equipment), and ways of efficiently developing structural designs for additional equipment with gas insulation (a transformer with gas insulation -- oil entrances, load switchers, dischargers, gas insulated conductors, etc.) were planned during the process of creative cooperation between the project planners of the long transmission line division of the Energoset'proyekt institute, the MK-52 builders of the Elektrostroypodstantsiya trust and the MU-1 installers of the Elektrotsentromontazh trust. This will make it possible to arrange the mechanical equipment taking into account a standardized grid of columns, maximally utilize prefabricated reinforced concrete, significantly curtail the consumption of steel and cast-in-situ concrete, and eliminate the work done to protect metal structures against fire, as well as use industrially manufactured barriers.

8225
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FUELS

EXPERIENCE IN DRILLING, DERRICK CONSTRUCTION

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian
No 8, Aug 79 pp 3-5

[Article by A. M. Zhdanov, deputy minister of the petroleum industry]

[Text] Mass socialist competition is now playing the leading role in the achievement by indexes of the production collectives. It is also acquiring great significance in the construction of wells.

An important result in three years of the 10th Five Year Plan is the constant increase in petroleum extraction. By comparison with 1975, the petroleum extraction with respect to the ministry of the petroleum industry has increased by more than 17%.

The Western Siberian oil and gas complex, which is today the primary base for further development of the oil industry is acquiring special significance.

The high rates of development of the petroleum industry in Western Siberia are the result of the unselfish labor of the oil field workers, builders, power engineers and collectives of all other branches of the national economy participating in the development of the Western Siberian petroleum complex.

Comparatively high petroleum extraction has been noted in the Komineft' and Udmurtneft' associations which grew by 7 million tons.

In 1978, the petroleum extraction in the Guzneft' association also increased. The collectives of the basic old areas in Tataria, Bashkiria, and Kuybyshev continued to work successfully. There, under the complex conditions of the transition of the majority of the petroleum deposits to the late state of exploitation, there is constant exploration work directed at stablizing the high level of petroleum extraction. As a result of the broad introduction of a number of technical-technological measures, it is continuing to be sustained.

The Stavropol'neftegaz, Grozneft', Saratovneftegaz, Nizhnevolzhskneft' and other associations are dealing with their problems.

This successful work has been promoted by the broadly developed socialist competition encompassing all collectives of petroleum workers. On the eve of the celebration of the first anniversary of the new constitution of the USSR more than 90 enterprises and organizations of the branch, about a thousand brigades of the leading occupations reported on the completion of the plans for three years of the five-year planning period ahead of time.

It is especially necessary to note the work of the drillers, the derrick builders and people engaged in the plugging operations. In three years of the tenth five-year planning period, in excess of the plan 1013 wells were set up and 549,000 meters of rock were drilled.

By the results of the socialist competition of 1978, the leadership of the Ministry of the Petroleum Industry, the Presidium of the Central Committee of the Trade Union awarded the ranks of the best drilling brigades, the best derrick building brigades to the advanced collectives of the branch. The record results achieved by these collectives have great significance in resolving the problems of 1979. The work of the branch as a whole for the five-year planning period depends to a great extent on the period from 1979 to the fourth year of the tenth five year plan. Noting the later progress in 1978, the high evaluations of the work of the individual collectives, it is also necessary to mention the still existing serious deficiencies connected with the low use of reserves.

In 1979 the collectives of petroleum workers and the branch as a whole has an intense plan for the extraction of petroleum, the drilling of 14.6 million meters of operating wells, the assimilation of about 5 billion rubles of capital investments.

The exploratory drilling is acquiring special significance for the support of the growth of the volumes of petroleum extraction to sustain the achieved level of production.

In recent years, along with the highly productive beds, a large number of comparatively small, lower productive petroleum deposits have been developed.

The realization of the goals set for the collectives of the drilling enterprises in 1979 requires careful analysis of their work considering the profound understanding of the situation in each petroleum district. A clear program for solving such current problems as future prospects is needed.

The main area is increased efficiency of drilling operations and insurance of its growth at higher rates.

The growth of drilling through out the branch in 1977 was 800,000 meters; in 1978 it was 1.5 million meters, and in 1979, more than 3.3 million meters are planned.

Therefore in the "basic areas for development of the national economy in 1976-1980" the following goal was defined -- to reduce by 25% the well installation cycle which most completely characterizes the efficiency of the drilling operations. This work is done in all areas: in derrick construction the goal is to achieve increased capacity for setting up the drilling rigs, in drilling technology, to increase the rate as a result of applying higher-output bits, improvement of the quality of the drilling muds, and so on, and in assimilation of the wells, the application of the most advanced methods of assimilation.

The assignment established in the current five-year plan for the Ministry of the Petroleum Industry with respect to reducing the well construction cycle as a whole throughout the branch is being fulfilled: whereast in 1975 it was 129.3 days, at the present time it has been reduced to 105 days.

Along with the technical-technological measures to reduced the well construction cycle, the initiative of the drilling brigade of State Prize Laureate of the Al'met'yevskoye UBR[1] of the Tatneft' Association D. M. Nurutdinov "Oil Wells -- for the Flow" has acquired great significance. The brigade of D. M. Nurutdinov brought the construction cycle to 26 days with an average duration of it with respect to the Al'met'yevskoye UBR of 41 days in 1977. The work experience of the brigade of D. M. Nurutdinov has received a high evaluation: the foreman, as initiator of the movement, received the State Prize, and the Al'met'yevskoye UBR was awarded the Challenge Red Banner of the Central Committee of the Party, the USSR Council of Ministers, the All-Union Central Trade Union Council and the Central Committee of the All-Union Lenin Young Communist League in 1978. The large group of workers of this drilling operations administration was awarded orders and medals for achievement of high indexes with respect to reducing the well construction cycle in 1978.

Many of the petroleum districts are already working by the DM. Nurutdinov method, although not everywhere with the same result. Therefore a deeper study of this advanced experience, the discovery of paths of more effective utilization of it are needed.

It is especially important that each existing brigade insures the same rates of drilling and building the wells as the advanced brigades.

As time has shown, the following brigades have significant capabilities. The brigade of foreman V. I. Volovodov, which is in its third year in Western Siberia, drilled 53,200 m in 1977; in 1978, taking on the obligation drilling 70,000 meters, it actually drilled 81,200 meters; in 1979 it stated the goal of drilling 100,000 meters. The brigade of Hero of Socialist Labor A. D. Shakshin drilled 48,200 meters in 1975, 57,700 meters in 1976, 63,000 meters in 1977, 80,100 meters in 1978. In 1979 it has obligated itself to drill 90,000 meters. It is possible to present many such examples.

[1] Drilling Operations Administration.

The advanced brigades are drilling more than the average with respect to all brigades of the UBR Administration (see the table).

Drilling Operations Administration	Mean annual drilling per brigade, thous. of m	Drilling per year with respect to best brigades, thous. of m
Nizhnevartovskoye UBR No 1	68.4	85.0
Nizhnevartovskoye UBR No 2	58.4	80.1
Al'met'yevskoye UBR	23.0	31.0
Aznakayevskoye UBR	23.4	31.0

On the basis of dissémination of the work experience of the best drilling collectives, it will be possible to meet the goals set for 1979. It is also necessary to take into account the demographic peculiarities of the upcoming period connected with the shortage of manpower.

Much also depends on the initiative of the advanced collectives in rendering aid to those who are lagging behind. In the branch there are examples of giving assistance to the foremen of the advanced brigades who have converted to laggards for a time. Thus, the drilling foreman of the advanced brigade Feklov raised several brigades to the level of its advanced brigades. Much has been done to educate the new generation. The painstaking work which has found reflection in the daily log has made it possible gradually for the lagging brigade to significantly raise its indexes.

At the present time special attention must be given to work with the collectives at a significant distance from the drilling bases and improvement of it.

Under the conditions of assimilation of new petroleum deposits it will be necessary not only to go from one geographic location to another, but also within each oil region they are more and more removed from the previously created bases. For example, in the last seven years the Bashneft' Association has gone far beyond the limits of its drilling bases. At the present time the drillers of Bashkiria, Tataria, Kuybyshev, Saratov, the Ukraine are working in Western Siberia; the drillers of Volgograd are working in the Komi ASSR; the drillers of Groznyy and Krasnodar are working in Georgia. A great deal of experience has already been accumulated with respect to the introduction of this method of organizing operations, which indicates its prospectiveness. It is interesting to note the work of the brigade of foreman Kinzebuletov from the Birskoye UBR of the Bashneft' Association which is working in Western Siberia. During the first year of work it drilled 40,500 meters, and in 1979 it is obligated to drill 50,000 meters.

Along with the honored advanced drilling collectives it is also necessary to give the derrick builders their due. If we are talking about the goals of the derrick builders, then first of all these include "increasing the buildability" of the drilling rig, that is, after the first general assembly of the drilling rig, the rig could be built without cutting, welding and so on. To a defined degree the Ministry of the Petroleum Industry is taking measures to equip the rig builders with modern equipment.

There are still significant reserves in all of the collectives for improving the organization of operations, and these reserves must be constantly made use of. The production time in many areas is still at a low level although recently the percentage of productive time has increased.

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CSO: 1822

FUELS

IMPROVING DRILLING EFFICIENCY IN THE STAVROPOL'NEFTEGAZ ASSOCIATION

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian
No 8, Aug 79 pp 12-16

[Article by B. K. Chelombiyev]

[Text] In recent years the technical-economic indexes of the drilling operations have been constantly improved in the Stavropol'neftegaz Association. From 1970 to 1978 the commercial rate of drilling operating wells increased from 743 m/st-month to 1558 m/st-month, that is, it more than doubled, and exploratory wells, from 407 m/st-month to 727 m/st-month, or an increase of 78.6%. The drilling per bit increased from 88 to 138.8 meters in operational drilling and from 28 to 55.2 meters in exploratory drilling. The mechanical drilling rate increased with respect to both goals -- by 69.5 and 34.2% respectively. The proportion of the productive time increased -- in operational drilling by 27.5% (to 82.9% of the total time) and in exploratory drilling, by 21.3% (to 82.3% of the total time).

The growth of the basic drilling indexes took place with simultaneous growth of the average depths in the operational drilling from 2933 to 3233 meters, and in exploratory drilling, from 3012 meters to 3805 meters.

Along with many causes having a positive influence on the growth of the technical-economic indexes, one of the basic ones must be considered to be the transition to the rotary method of drilling.

The transition from the turbine to the rotary method of drilling was promoted to a great extent by two factors. First, the transition noted everywhere to drilling the primary hole of the well (for operational casing) with decreased and small diameter and the necessity connected with this of going over to small turbodrills, the low torques and high rpm of which could not meet the requirements of forced drilling of wells.

The second factor was the anomalously high temperatures of the rock of Stavropol'ye which reach 130 to 140° C at a depth of 3000 meters and exceeds 200° C at a depth of 5500 meters or more. The depths of the wells in the operational and exploratory drilling were more than 3000 meters in 1960.

The increase in depths of the wells and the anomalously high temperatures connected with this leads to a sharp decrease in the period between repairs of the turbodrills and, as a consequence, to worsening of the technical-economic indexes of the drilling. This led to the search for more optimal ratios of the diameters of the casing and the holes and also the methods of drilling.

Before trying to find the most efficient diameter of a well for an operating casing, the bit with a 243 mm diameter was the basic bit. In 1963-1964 wells were drilled with different diameters of bits under comparable conditions. To exclude randomness of the conclusions, the results of processing more than 4500 bits were analyzed. The analysis demonstrated the unquestioned advantage of 214-mm bits (see Table 1).

Table 1

Operating indexes	Bit sizes		
	F-190	F-214	F-243
Average drilling per bit, meters	27.2	32.7	29.6
Mechanical velocity, m/hr	2.9	3.2	2.7
Trip speed, m/hr	1.2	1.4	1.2

After selecting the optimal bit diameter for drilling for operational casing, broad industrial tests were run on the methods of drilling the wells. The results of this work demonstrated that in all intervals of identical drillability the indexes of the rotary method are 50-80% superior to the indexes of the turbine method with respect to hole made per bit and 15-30% with respect to trip speed (see Table 2).

The final advantage of the rotary drilling with a 214-mm bit by comparison with the 243 mm turbine bit was demonstrated after drilling comparable wells. The wells were drilled by the same brigade in the same area. As a result, the wells drilled by the rotary method using 214-mm bits were significantly superior with respect to all indexes to the indexes of the wells drilled by the 243-mm bits using the turbine method. After these experiments, the course was finally set to make the transition to drilling wells by the rotary method, and in 1967 the percentage of hole drilled by the rotary method was more than 80% and in 1970 it reached 91.7%. Since 1972 the entire volume of wells drilled in the amount of 300,000 to 350,000 meters in Stavropol'ye has been by the rotary method.

However, the transition to the rotary method of drilling turned out to be not so simple as appeared at first. The first years demonstrated that the most complete use of all possibilities of the rotary drilling is impossible without solving two basic problems: improvement of the fitness of the ground equipment (rotors and swivels) and strengthening of the drilling tools.

The improvement of the fitness of ground equipment does not depend on the drillers and is within the competence of the design organizations and the

Table 2

Drilling interval	Drilling method	Hole made per bit, m	Mechanical speed, m/hr	Trip speed, m/hr	Drilling conditions: Maximum load, tons	Drilling conditions: Output capacity, ℓ/sec	Drilling conditions: Pressure, tech. at.
800 1600	Turbine	150	20,5	6,3	10 -12	40	140
	Rotary	270	15,0	7,5	10 -12	60	80
1600 2300	Turbine	39	10,4	2,1	10 -12	45	140
	Rotary	71	5,4	2,7	10 -12	45	90
2300 3000	Turbine	15	5,9	1,2	12--14	45	150
	Rotary	23	3,9	1,4	14 -16	45	100
3000 3500	Turbine	9	4,1	0,6	12--14	45	130
	Rotary	15,2	2,7	0,8	14 -16	45	100

Note. The TS-5A, B-7 1/2, T195R and A7N1 turbodrills were used.

Table 3

Year	Indexes: Hole made in a year, thous. of m	Amount of rotary drilling out of total hole made, %	No of broken broken drill stem with respect to 8-fold thread
1963	312,3	37,6	53
1964	332,7	50,7	97
1965	352,8	66,7	122
1966	366,2	75,1	132
1967	395,2	89,8	130
1968	389,1	82,0	102
1969	420,0	85,7	78
1970	443,8	91,7	47
1971	441,1	94,2	39
1972	377,3	94,2	27
1973	366,2	99,3	14
1974	339,5	99,3	2
1975	324,0	99,97	—
1976	316,4	100,0	1
1977	293,5	100,0	—
1978	313,47	100,0	—

organizations producing the equipment. The Uralmashzavod Plant jointly with the VNIIneftemash designed and produced the U-250 swivels and R-560 rotors in a comparatively short time, which basically correspond to the requirements of drilling deep wells by the rotary method.

The fast solution of the problem of increasing the strength of the connection of the couplings to the drilling tools was not achieved through the manufacturing plants; the drilling organizations themselves dealt with this problem. On going over to the rotary method of drilling, the number of breaks in the 140-mm drilling tools has increased sharply. Thus, whereas there were a total of 53 such breaks in 1963, in 1965 there were 122, and in

1966, 132 (Table 3). More than 98% of the breaks occurred in the upset part with respect to the first thread of the pipe. The emergencies with the drilling tools reduced all the advantages of the rotary method of drilling to naught.

By systematic monitoring of the condition of the drilling tool and timely discovery of the beginning of the appearance of cracks in the upset part of the pipe, the drillers of Stavropol'ye tried to prevent emergencies of this sort.

However, as was proposed, the practice of timely discovery of cracks in the upset part of the drill stem, although it permitted a sharp decrease in the number of emergencies, it could not reduce them to a minimum, for there is no law of formation or development of the cracks. Theoretically maximum discovery of the formation of cracks is possible by periodic checking of the condition of the pipe every 3 to 4 days of drilling, but this is difficult to do. In addition, defectoscopic rejection of the pipe, although it permits a decrease in the number of breaks of the drill stem during operation, can occur only at the expense of junking drill stem which has not been worn completely out. In this case the percentage of carded pipe was high, and it led to large amounts of pipe written off for metal fracture.

Therefore the drillers of Stavropol'ye, pursued the path of strengthening the drilling connection to the drill stem along with increasing the volumes of defectoscopy of the drill pipe during drilling.

The study of the work experience of the Krasnodar and Grozna drillers made it possible to adopt a process for strengthening the connection of the coupling to the pipe proposed by the SevKavNIPIneft' Institute; technology has provided for welding the drilling coupling to a special ring previously seated on the upset part of the pipe. The observation of the first sets assembled from the drill stem with welded couplings demonstrated that the possibility of the appearance of cracks along the thread of the upset part of the pipe decreases by 10-15 times for identical periodicity of checking. Since in 1968 in practice all the basic drill stem has gone through mandatory preparation for rotary drilling by the adopted process.

At the present time not one piece of drill stem of prefabricated construction designed for rotary drilling goes to the drilling rigs with unwelded drill coupling.

In recent years, with the help of the Electric Welding Institute imeni Paton, a new, simplified method of fastening the lock to the drill stem was developed. The essence of it is that the couplings, for all the drill stem, after they are turned in the hot state, are welded to the body of the pipe and the nut to the special ring previously seated on the upset part. The complexity of going over to the new assembly process consisted in the fact that the drill stem of alloy seal required special welding conditions which had to be altered depending on the composition of the steel. The violation of these conditions always led to the appearance of cracks at the

point of welding on the coupling, and as a rule, to junking of the pipe. The basis for the new process came to be preliminary heating of the upset parts of the drill stem before welding the connections to them. The heating is done to a defined temperature by using special induction furnaces of the NIP 168 type. Since 1975, the assembly of all the drill stem has been only by the new process of welding on the coupling.

The transition to the new process of assembling of the drill stem made it possible to eliminate the preliminary operations: turning of the upset part of the drill stem to seat the special ring, manufacture of this ring and seating of it on the "hot" upset part in a strictly defined location. And the main thing, the new process made it possible to strengthen the connection of the coupling to the drill pipe, and as a consequence, to reduce the number of breaks of the pipe in the upset part to a few cases per year (Table 3).

It must be noted that the operative introduction of the new process of assembling the drill stem to a great extent promoted the completion of the construction of the special shop for preparing drill stem for rotary drilling in 1972. The introduction of this shop into operation made it possible to concentrate all of the operations of the preparation of the new drill stem in it in amounts satisfying the demands of all the drilling enterprises of the association. In addition, the shop performs repairs on the drill stems which have been in use, it welds the couplings to the weighted drill stem and builds up wear-resistant collars on the butt-welded drill stem TBPV. The operation of the shop has made it possible for the association to conduct a united technological policy in the preparation and the use of drill stem and also significantly to reduce the fleet of drilling tools, to reduce the consumption of drilling tools per liter of drilled hole from 19.7 kg/meter in 1972 to 14.9 kg/meter in 1978.

In the improvement of the indexes of the drilling operations a significant role is played by the purely technological measures introduced in recent years. One of the basic ones must be considered to be the increase in loads to the certified loads for bit No 9 -- the basic size of bit by which up to 70% of all of the drilling is done.

Before establishing these targets by the workers of the Pyatigorsk branch of SevKavNIPIneft' Institute jointly with the technologists of the drilling organizations of the association, it was considered that the optimal load under the lithologic conditions of this location for bits of this size was within the limits of 15-18 tons.

By drilling a number of reference-process wells it has been proved that increasing the load to the certified load of 24 tons offers the possibility of increasing the hole made per bit by 20-25% when drilling a section made up of rock medium strength and to increase the mechanical speed by 25-30%; in the Maykopskiye deposits made up of soft rock, these indexes are still higher. At the present time all of the process-condition flow charts put out for drilling provide for drilling with 215-mm bits with loads close to the certified load.

One of the reserves for improving the technical-economic indexes for slotting is the use of jet bits under actual jet conditions.

The drilling of wells under comparable conditions of Stavropol'ye indicate that as a result of increasing the escape velocities of the drilling mud from the tips of the jet bits from 50-60 m/sec to 100-110 m/sec alone makes it possible to obtain a 20% increase in hole made per bit, and the mechanical speed almost doubled.

In recent years the Stavropol' drillers have done a great deal of work with respect to using the jet effect.

Noting the improvement in the technical-economic indexes of rotary drilling, it is impossible not to note the reserve built into the operations with respect to elimination of emergencies with the bits and completeness of the use of them. The transition from turbine to rotary drilling has eliminated the possibility of indirectly determining the leading wear of the bits with respect to the bearing by the increase in moment on the shaft of the turbodrill and periodic halting of it. This fact and also the fact that after going over to the rotary method of drilling the loads on the bits were increased, first sharply increased the number of emergencies connected with halting of the rolling cutters on the bottom. This type of emergency became second after breaking of the drilling tools. In order to prevent breaking of the bits, the drillers began to underuse them, which also had a negative effect on the final results of the drilling.

The control inspection of more than 4000 worn out bits performed by a branch of the SevKavNIPIneft' in 1967-1968 demonstrated that along with individual uses of them for too long, up to 40% of the bits were brought out of the hole 20 to 30% unused.

In order to eliminate these deficiencies, the practice was started of equipping the drilling rigs with rotary torque meters. The tests run on the IMR-3 rotary torque meter produced at that time by the Grozna branch of the VNIIKAneftegaz Institute demonstrated its low fitness, not exceeding 150-200 hours of operation.

The efficiency experts of the association modifed the IMR-3 torque meter, as a result of which its operating period between the repairs was increased to 3000 to 4000 hours.

In parallel with the manufacture of the modified rotary torque meters and equipment of the drilling associations with them, measures were taken with respect to keeping rejected bits from reaching the drilling rigs. Special attention was given to detecting hidden defects discovered by instrument measurements. For this purpose in 1970 a special laboratory was created with a production-engineering service base for checking the quality of the bits coming from the manufacturing plants. In 1978 alone, the laboratory picked out more than 5100 bits from 140 to 346 mm in size, that is, in practice all of the bits coming into the association. Here it was determined that more than 3000 bits had one deviation or another from the All-Union State Standards and the ratings.

During the overall time of operation of the laboratory to check out the quality of the incoming bits (1970-1978) about 35 bits were checked; it was established that more than 20,000 bits did not correspond to the fixed requirements. In the indicated period, 3300 bits costing 360,000 rubles were returned to the plants.

The rejection of unsuitable bits made it possible for the driller to obtain significant profits as a result of a decrease in the emergencies and an increase in the hole made per slotting.

The personnel played an especially important role in improving the drilling indexes.

Fast, correct introduction of the best technological solution in all drilling elements depends on a clear understanding and literate execution of all parts of the introduced measures by all the executive agents and, above all, the drilling foremen, which in turn depends on the level of competence and experience of their work. As a result of the effective measures adopted at the beginning of the 1970s by the Ministry of the Petroleum Industry, the drilling enterprises and associations were able in a comparably short time to reinforce the management of the drilling brigades with graduates from the branches of the petroleum technical high schools located in the petroleum districts.

At the present time out of 46 drilling foremen, 10 have higher education, 28 have middle technical education and only 8 foremen have great practical experience. All of them have completed the specialized production engineering school and are not inferior to the first two categories with respect to competence of management of the drilling brigades.

In the association there are significant reserves which should be completely utilized. They consist in further improvement of the drilling conditions, an increase in drilling volume with increased loads on the large-size bits, an increase in the escape rate of the drilling mud from the heads of the bits, and so on. All of these measures are provided for in the plan for 1979-1980.

However, it is impossible to expect as much of an effect from their introduction as has been achieved in past years because the basic reserves which depend on the executive agents have to a significant degree been exhausted.

Basically, the further improvement of the technical-economic indexes of drilling operations must be expected from introducing the set of measures planned by the mastery of the petroleum industry in a program aimed at multiple increase in the drilling operations indexes.

Special hopes for the new types of bits, especially bits specially made for rotary drilling with strength significantly exceeding the strength of the bits produced at the present time.

As for the bits, it is necessary to consider two reserves which should be used in the near future. One of them is improvement of the quality of the bits.

In 1978, the technical services of the association performed special experiments to determine the comparative fitness of the 214 mm bits made in accordance with the technical specifications and having positive tolerances with respect to the basic parameters. For this purpose all of the bits were broken down in five groups. The first group was made up of bits not having deviations, and the remaining four groups included those having deviations with respect to individual parameters. A total of 62 bits were used.

The bits were worn by wedging the bearings with respect to the torque meter in rock of identical wedgability. The results of this operation are presented in Table 4. As is obvious from the table, the bits having positive allowances gave on the average 19-48% less hole, an 11-24% lower strength and 8-32% up in mechanical speed.

Another reserve which must be used at the present time is competent selection of the bits for the drilled section. Here the difficulty consists in the fact that the supplier plants manufacture and deliver the bits by types uniformly within the year. As a result, the association for example, in 1979 received its entire annual supply of 215.9 SZGN bits and 50% of the annual supply of 215.9 SGN bits in the fourth quarter and 75% of the supply of 295.3 MGV bits in the third quarter. IT is necessary to send the presently available bits to the drilling rigs. The losses connected with this are indicated by the experiment performed by the technologists in 1978 in the Neftekumskoye Drilling Operations Administration.

The experiment consisted in the following. The brigade (headed by drilling foreman A. I. Bol'nikh) which drilled operating wells 3500 meters deep in the carefully studied area of Belozerskaya, after drilling well No 22 which was done by available bits, was offered the possibility of drilling well No 23 with careful selection of the bits for reserve. As a result, the hole made per bit was increased by 28%, the trip speed by 25%, the bit consumption was decreased from 31 to 24, and the actual commercial speed was increased from 1569 to 2108 m/st-month.

The necessity for equipping all the wells with the required types of bits is obvious. In our opinion, the time has come to create a large bit base or warehouse for all the associations of the Northern Caucasus where it will be possible to obtain the required bits and turn in the unneeded ones at any time.

Table 4

Group of bits	Parameters			No of tested bits	Average operating indexes					
	Axial clearance N-0.6	Radial beet N-0.8	Difference in height of rolling cutters, N-0.8		hole made		strength		mechanical speed	
					m	%	hr	%	m/hr	%
I	H	H	H	30	77,6	100	14,6	100	5,32	100
II	+0,1	+0,3	+0,2	11	39,8	51,3	11,0	75,6	3,62	68,0
III	H	+0,7	+0,2	8	56,1	72,3	12,7	87,0	4,42	83,1
IV	H	H	+0,7	6	63,0	81,2	12,9	88,4	4,88	91,7
V	+0,1	H	+0,2	7	54,3	69,9	11,9	81,5	4,56	85,7

Notes. 1. Type of bits 4K-214SG, 5K-214SG.
2. Test interval 2300-3450 meters.

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IMPROVING SUPER-DEEP DRILLING INDEXES

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian
No 8, Aug 79 pp 19-22

[Article by F. M. Katsman]

[Text] Widely developing the socialist competition, the drilling enterprises of the Grozneft' Association fulfilled the drilling operations plan in 1978. This was achieved as a result of a number of measures.

In the association the drilling of the wells proceeds under complex mining and geological conditions characterized by great depths -- 87% of the wells have a designed depth of more than 4500 meters, the presence of rock of different hardness, from soft to strong with steeply sloping beds causing the necessity for dealing with natural convolutions of the well by using several bottom systems (compositions) for the drill stem, the presence of anomalous stratal pressures from those significantly exceeding hydrostatic pressure to less than hydrostatic pressure giving rise to the necessity for using thickened drilling muds with a density to 2.3 g/cm^3 or drilling muds thinned to 1 meter or less. The high bottom temperatures reaching 180° C, high mineralization of the rock, up to passage through a thick body of salt deposits, force the application of different drilling muds from the ordinary clay muds, on a fresh water base, to different special drilling muds (limestone, gypsum, limestone-bituminous, and so on) treated with 20 chemical components in different combinations and ratios. Recently they have even had to deal with hydrogen sulfide aggression.

All of this forces the application of multiple-column (4 to 5-column) designs of the wells using casings of all types and sizes (from 426 to 114 mm), all types of Soviet and imported steel, which, in turn, leads to the necessity for applying several drilling columns for drilling each well with the use of all types and sizes (from 140 to 73 mm in diameter, both Soviet-made and imported) and also UBT drill stem from 299 to 89 mm in diameter.

The drilling is basically done by the Uralmash-4E rigs and also the Uralmash-3D rigs, and so on.

In 1978 the association performed drilling operations at 29 sites located in the territory of Chechen-Ingushetia, Kabardino-Balkaria and Georgia.

Under these conditions, in order to insure rhythmic work by the collective made up of 6 drilling enterprises, one of which is conducting drilling operations for the fifth year completely by the watch-expeditionary method*, in the Gruzneft' Association, the "modern organizational chart for drilling operations in 1978" is used as the basis for organization. It provides for all operations entering into the construction cycle of each well and regulates the execution of these operations in time in order to insure continuity of the well construction cycle. The chart provides for the time of setting aside the ground for drilling, the time of development of the planning estimate documents, the time for construction of the buildings on the sites or the wells (roads and platforms for the drilling rigs, residential settlements, electric power transmission lines and substations, telephone lines or radio communications, water lines and water pumping stations, oil lines, recultivation, and so on). This permits timely preparation for the performance of the operations for the drilling brigades. The chart is the basic document for operative planning of operations for the year for each brigade. The actual possibilities of each drilling brigade, a comprehensive program of operations of the collective of each production subdivision under the drilling operations administrations are set forth in it.

The specific nature of the superdeep drilling consists in the fact that the complete well construction cycle does not end in one year; the planned geological conditions, in view of complexity of the structure of the drilled deposits, frequently do not coincide with the actual ones, which, in turn, leads to serious complications which cannot be foreseen. Accordingly, the drilling brigades are given sliding assignments. Over the course of the year, taking into account the actually developing situation, the drilling brigade must perform the maximum possible amount of work tied to the common problems of the entire collective.

Beginning with the annual assignment, each drilling brigade receives a strictly substantiated assignment for the month. This is the guarantee of efficient operation and fulfillment of the stated planning problems.

In order that the work of the rig building shops provide for a reduction in the well construction time, the planning of the big building operations is set up for a qualitatively new base as a result of the introduction of four-element line PERT charts, which has made it possible to reduce the installation time for the drilling rigs. Each hour of work has become stressed; each brigade, element, industrial, engineering and technical worker clearly understands the volume of operations which must be performed over the year to reduce the well construction cycle.

All this has made it possible to drill 173,000 meters with a plan of 156,000 meters, including operational drilling of 58,900 meters with a plan of 48,000 meters, exploratory drilling of 114,100 meters with a plan of 108,000 meters. It ended with the construction of 46 wells with a plan of 37 with

* [Translator's note: By the watch-expeditionary method of operation the crew are transported to the drilling site where they live for extended periods, with periodic return for several days to their permanent residence as in American off-shore drilling.]

with actual commercial rate of 217 m/st-month with a plan of 197 m/st-month. In operational drilling the plan was exceeded by 32,4%, and in exploratory drilling, by 1,6%.

The well construction cycle was 575 days with a plan of 674 days.

Out of 85 drilling brigades, only 5 failed to fulfill the planned assignments. The goal was set of working in the fourth year of the five-year plan without any lagging brigades under the motto of "The five-year plan fulfilled by all drilling brigades."

There are reserves for this. As a result of the organizational idle time alone, 76,947 hours are lost (13.4% of the calendar time), 43,725 hours (7.6%) as a result of emergencies and rejects; for auxiliary operations 24.9% or 143,330 hours are owed.

The analysis of the basic time losses indicatesthat in the idle time the basic losses are connected with the absence of casing, which was a consequence of poor monitoring of the of the realization of reserves by the association.

Round the clock work by the geophysical service is needed. A large percentage (44.7%) is taken up with auxiliary work of flushing, treatment of the drilling muds, analyzing the well.

Much must be done to prevent emergencies and eliminate rejects in the work, creating a specialized service for this purpose.

Measures have been developed and approved for improving the productivity of labor, improving the technical indexes and the quality of construction of the wells. These measures have provided a significant increase in volume of introduction of new type AN and AZ bits, diamond bits with synthetic and natural diamonds, and ISM type bits. In 1978 these bits were used to drill a total of more than 27,000 meters; a cost benefit totalling 336,000 rubles was obtained.

The introduction of new types of bits, the improvement of the drilling process, the application of new compositions of the bottom of the drilling column permitting a significant increase in load on the bit, the introduction of lubricating additives to the clay drilling mud has on the whole throughout the association permitted an increase in the mechanical drilling time in the overall time budget from 11,3% in 1977 to 12.9% in 1978 and an increase in the hole made per bit to 35.3 m in 1978 as opposed to 30.1 m in 1975.

These indexes can be improved further with the execution of a set of technological and organizational measures: introduction of new types of bits everywhere, including the tricone bits with sealed oil-filled bearing; improvement of the structural design of the high-output single-cone bits

with increased tooth span of 19.5 to 215,9 mm; 244,5 mm; achievement of maximum deviation of the wells with optimal axial loads on the bit (the application of sliding bottom compositions of the drilling column, stabilizers above it); further work on lubricating additives, the organization of the inspection and quality control of the incoming bits in the drilling organizations.

By comparison with 1977, in 1978 throughout the Grozneft's Association the drilling emergencies increased as a result of an incrase in emergencies with the casing, the bits, and the geophysical instruments. The remaining types of emergencies remained on the previous level and dropped somewhat.

By comparison with 1977, time spent on reinforcing the wells (16.4% as opposed to 16%) and on auxiliary operations (24.9% as opposed to 23.3%) increased. The expenditures of time on reinforcing the wells connected with an increase in depth of the wells, the introduction of new areas with greater depths into exploration, complex geological conditions of operation, remain inadmissibly high.

The increase in the design depths of the wells leads to complication of the structural design of the wells.

The limited load capacity of the drilling rigs used (Uralmash-3D, 4E), minimum clearances between the well wall and the lowered casing, complexity of cementing of the latter under the conditions of appearances and absorptions with large specific gravities of the plugging solutions force the application everywhere of sectional lowering of the casing. Increasing the number of lowered sections leads to additional expenditures of time connected with checking the previously lowered sections, checking the seal of the future connections of the columns in the wells.

Significant reserves with respect to improving the technical-economic indexes of drilling are hidden in the decrease in time spent on reinforcing the wells.

The reserves consist in improving the load capacity of the drilling rigs (to 250-300 tons), further simplification of the structural designs of the wells as a result of more detailed study of the geological conditions of application of the casings of Soviet and imported production with increased strength and with a decrease in the sizes of the couplings (or without couplings), the development of structural designs and the organization of production of stepped cementing couplings (for wells with small clearances), check valves and other process equipment for the casing, further improvement of the process and organization of operation with respect to preparing the holes and the casing for lowering.

Large reserves are also hidden in decreasing the time for the auxiliary operations in the overall time budget (in 1978, 24.9%). Almost half of the time reserves were taken up by operations of preparation, chemical treatment of the drilling mud and flushing the wells; 7.3% of the auxiliary time was taken up with field geological operations.

In order to improve the technical-economic indexes of drilling, first of all development of the structural designs of the circulating system and its introduction on all of the drilling rigs of the association, the introduction of vibration screens with double cleaning of the mud, the development and introduction of new chemical reagents are needed.

The equipment of the geophysical servicing organization with instruments for pressures to 1200 technical atmospheres and a temperature to 250-300° C and the organization of their 24 hour operation will permit the time for performing the geophysical operations to be reduced.

The introduction of improved instruments for monitoring the drilling parameters will make it possible to obtain 18 technological parameters continuously during the drilling process, to calculate the vapor and stratal pressure of the drilled rocker, correctly select the required specific gravity of the drilling mud and significantly improve the technical-economic drilling indexes as a result of introducing the process of equivalent drilling with adjustable differential pressure in the well-bed system. The future belongs to this method for drilling superdeep wells under complex geological conditions.

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ATTAINMENT OF MAXIMUM DRILLING RATE BY SURGUT ADMINISTRATION

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian
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[Article by A. K. Sabirzyanov]

[Text] In 1978 the drilling operations in the association were performed by the administrations, including four administrations of the Surgutneftegaz Association (the Birskoye Drilling Operations Administration of the Bashneft' Association and the Yershovskoye Drilling Operations Administration of the Saratovneftegaz Association).

The annual drilling plan was fulfilled by all of the drilling operation administrations. Some 1,233,100 meters were drilled (102.1% with respect to the plan). The increase by comparison with 1977 was 468,600 meters or 61%.

The hole made per brigade and the output capacity per worker by comparison with 1977 increased by 12.2 and 11.7% respectively.

The Surgut Drilling Operations Administration No 2 achieved the best results bringing in wells in 1978. The administration was created at the end of 1976, but the collective was awarded the Challenge Red Banners with First Prizes for the progress made in 1978: the banners of the Central Committee of the CPSU, the USSR Council of Ministers and the All-Union Central Trade Union, the Ministry of the Petroleum Ministry, and the Surgucneftegaz Association.

For the first time in the history of drilling wells in Western Siberia, all of the drilling brigades in the drilling operations administration drilled 80,000 meters or more.

With an increase in the volume of drilling by 2.1 times by comparison with 1977, this administration achieved the following basic indexes.

Some 246,000 meters or 107% by comparison with the plan were drilled. Some 102 wells were turned over which was 27.2% above the plan. The commercial rate was 4853 m/st-month, which is 24.5% above the planned level. The cycle

time for constructing one well was 32.5 days with a planned time of 58.6 days and with average cycle duration for the cost accounting method of 44.8 days.

The productivity of labor in meters for one worker was 637.5 meters or 11.4% higher than planned, 9.4% higher than the achieved average productivity of labor with respect to the cost accounting administrations[1].

The hole made per bit was 265.4 meters, and the mechanical drilling speed was 39.93 m/hr, which is 4.2 and 14.1% higher respectively than in 1977 at the same time as on the whole with respect to the cost accounting administrations the growth was 1.4 and 0.5% respectively.

The quality of well construction throughout the Surgutskiy UBR [Drilling Operations Administration] is the highest. The percentage of directionally drilled wells not falling into the tolerance circle is a total of 2.9% with 7.6% average with respect to the association. The number of wells with deviation of the curvature was a total of 1%, whereas throughout the association this index is on the 17% level.

The emergencies and rejects are reduced to a minimum; a total of 0.8% in the drilling time budget is expended on elimination of them. Accordingly, there are in practice no wells terminated for emergency or rejection.

The actual cost of 1 meter of drilling was 90.63 rubles with an estimated cost of 100.6 rubles. A balance sheet profit of 1,508,000 rubles was obtained, including 208,000 rubles above the plan.

What are the defining factors insuring good results of the activity of the Drilling Operations Administration?

It is impossible to consider that the highest indexes obtained in 1978 are entirely comparable to the results of other drilling operations administrations of the association. The following objective factors had a prelonged effect on the success of the matter:

Less depth of the wells (average depth with respect to the administration 2299 meters, and with respect to the association, 2461 meters);

A larger number of wells in one group base than in the other drilling operations administrations (in this administration 16.6, and with respect to the association, 10 wells), which plays an important role in insuring the best organization of production administration of the drilling operations on all levels (increased steadiness of the object of the operations, that is the group, and hence a smaller number of drilling rigs in the project;

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[1]The comparison here and hereafter is made with respect to the administrations of the Surgutneftegaz Association, that is, the comparisons of the cost accounting method, for it is not comparable with the contract administrations.

the best service technology both for the equipment and the drilling process itself; greater possibility of creating good working and living conditions, and so on);

Provision with new drilling rigs type BU-80 BrE;

Two-thirds of the drilling was performed without installing blowout-control equipment, which arose from the geological-technical conditions of the Lokosovskoye deposit;

Working with filled foundations on the floodplain part of the Lokosovskoye field which are more efficient than the rock and soil foundations in practice in the nonswampy Bystrinskoye field;

Small volume of exploratory drilling by comparison with the other administrations;

The complex of organizational and technical-technological measures and the discovery of the reserves were defining in the activity of the Surgut Administration of Drilling Operations No 2 in 1978.

The organization of operations in Drilling Operations Administration No 2 is distinguished by the following peculiaries:

1. Production planning for the near future (one or two years) which consists in substantiation of the possible drilling sites, their distribution with respect to area, priority and times of construction, groups, their types (layouts), movement of the drilling rigs and drilling brigades, the presence of reserves, and so on. All of this has been deeply and comprehensively substantiated, it has been tied to the customer (NGDU [Oil and Gas Extraction Administration]), adjacent enterprises (contract enterprises) and the association, and it has been delivered to each drilling brigade, shop, administration, and all of the industrial, engineering and technical workers.

When the production plan is formulated, successive solution of the realization begins under the control and supervision of the administration chief.

Such work was performed by the other drilling operations administrations, but no where on the required level.

2. Selection, training and deployment of the industrial, engineering and technical personnel, selection of the engineering and technical, and also the industrial personnel was made by the chief of the Drilling Operations Administration. The industrial workers as part of the drilling brigades were selected especially carefully. The drilling crews, even with seniority, are first put into a new formed brigade, they go through a long (up to 6 months) apprenticeship in operating brigades singly or in watches. Brigades were formed from the best workers going through apprenticeship.

The chief of the Drilling Operations Administration in practice knew all of the workers of the drilling brigades.

3. The issuance of objective assignments to the executive agents with actual time of execution and rigid monitoring of their fulfillment with rewards for independent solution of these problems. In cases where the executive agent cannot solve the problem itself, it must report this to the one issuing the assignment in a timely manner, explaining the causes for which the assignment could not be carried out.

4. Coordination of activity between the Drilling Operations Administration and the contract (adjacent) enterprises and their interrelations. The adjacent enterprises were given assignments that were exceptionally clearly formulated with respect to volume, organizational or technical solution and times (charts, requests, orders, technical documentation, inspection, and preparation of the operations site).

5. Educational work with the drilling brigades and inside the drilling brigades.

6. Organization of socialist competition among all elements of the enterprise collective.

The enumerated peculiarities of the production administration provided for the possibility of creating a strong collective both as a whole and in its elements, watches, brigades, shops and administrative apparatus.

High technological indexes, emergy freeness, practical absence of rejects and complications in the Surgut UBR-2 [Drilling Operations Administration-2] were determined by the personnel.

Although the process regulations are in practice standard for all drilling operations administrations, the discipline for their application and introduction, the creative approach and search for reserves, rigid observation of the approved regulations by the industrial, engineering and technical workers distinguished and distinguish the practical activity of this drilling operations administration from the others.

In the Surgut UBR-2 there is a clear system for working with young specialists. The training of the young specialists who have graduated from the institutions of higher learning and technical high schools is in accordance with the plan approved by the chief engineer of the administration. They begin their labor activity in the drilling brigade where they work for 2 or 3 months in the work space, after which they are sent to one of the drilling brigades as technologist. Each one is issued the "memorandum to workers of the technological service" developed in the drilling operations administration in which the technological regulations for the drilling of the wells are discussed; from the first steps the specialist is oriented not only to the purely technological work and the problems of safety engineering and the operation of the drilling equipment, but also constant contact with the workers.

For constant growth of the technical-technological drilling indexes, and creative initiative of the technologists, competition was organized. The results of the socialist competition are summed up at an expanded meeting of the drilling committee and the administration. The technological element which occupies first place is awarded a money prize in the amount of 150 rubles.

In each drilling brigade a log is kept with respect to technical training. The developers of the technological service familiarize the members of the brigade with what is new, with new process means.

A special log is kept by the technologists of the drilling brigade on analysis of the drilling conditions, where all types of compositions of the bottom of the drilling column when drilling each well, the variation of the curvature parameters by intervals with respect to each slotting; the parameters of the drilling conditions, the introduction and consumption of chemical reagents, and so on.

These measures permitted a significant rize in creative initiative of the techologists. As a result, the greater part of the innovations were first introduced at Drilling Operations Administration No 2. These include the following: the ribbed stabilizers -- aligning devices for directional drilling, suspension of working columns, the introduction of a hydraulic mixer and tanks for fast introduction of chemical reagents, modified vibration screens for fastening the screens with small mesh (0.7 × 0.7). The introduction of silt separators which are now installed in all of the drilling brigades was first started here.

A distinguishing feature of the work of the drilling brigades of the Surgut Drilling Operations Administration No 2 is the directionalness of it -- the work under the motto "Without injuries, emergencies or complications" to achieve maximum production indexes. For these purposes, work is constantly being done with the worker, primarily with the drilling foremen. The educator-mentor, drilling foreman rallies the brigade collective, inspires fulfillment of the goals facing them. In the brigades there are monthly meetings at which the achieved production indexes are considered, all of the omissions for the month are discussed, and the obligations for the new month are adopted. The workers assume individual obligations which are approved by the administration. Then the collective applies every effort and all of its skill to the meeting of these obligations.

The meetings in the drilling brigades and the adoption of the socialist obligations improve the mutual sense of personal demand, they improve labor discipline, the acceptance and turning over of the watches, and so on.

One of the defining factors in the successful activity of the Surgut UBR No 2 is the exceptionally serious attention which is given to the development of socialist competition to achieve maximum production indexes by the administration, the party, trade union and komsomol organizations.

At the present time there are 15 different forms and types of socialist competition in the Drilling Operations Administration.

In the administration a great deal of attention is paid to the initiative that starts directly with the workers. Thus, the komsomol-youth brigade of the drilling foreman V. I. Shchavy has issued a call to all of the komsomol-youth collectives to develop socialist competition for a worthy celebration of the 18th Congress of the Komsomol and it has obligated itself to fulfill the four-month plan with respect to drilling operations by 25 April 1978, that is, the day of the opening of the congress.

The brigade has met this obligation honorably and drilled more than 8000 meters over the plan.

Supporting the iniative of the advance collectives of Moscow who decided to complete the assignment of the third year of the 10th five year plan for the first anniversary of the new constitution of the USSR, the drilling brigade of foreman A. B. Manakov completed the annual drilling plan on 30 June; the brigade of V. I. Volovodov completed the plan on 2 July, and the brigade of V. I. Shchavy, on 3 August.

Participating in the composition for the right to bear the honorary watch in honor of the extraction of a billion tons of oil, all three drilling brigades adopted new, increased socialist obligations with respect to well drilling in 1978.

These drilling brigades are participating actively in labor rivalry with the glorious brigades of Tyumen' oblast, such as the brigade of Hero of Socialist Labor G. M. Levin, foreman V. I. Gromov, who drilled 80,000 meters.

All of this is providing incentive for the drillers to achieve higher indexes and to look for reserves.

In order that the experience of the UBR-2 [Drilling Operations Administration No 2] be able to be widely used by other enterprises, various means have been applied (radio, press, television, meetings, and so on). In addition, in August 1978 a Surgut UBR-2 Day was held with a program previously distributed to all of the enterprises. The drilling foremen, engineering and technical workers, the management of all of the association enterprises and also the leaders of the party, komsomol and trade union organizations were invited. The representatives of the UBR-2 presented a detailed discussion of their experience and what is characteristic about their work. By the results of the meeting an order was issued throughout the association aimed at maximum utilizaiton of everything advanced in the work of the Surgut UBR-2. At the present time much of what was the property of the drilling brigades of the Surgut UBR-2 alone in 1978 has become daily practice in many of the collectives of the Surgutneftegaz Association.

The brigade of foreman T. K. Kinzebulatov from the Birskoye UBR (the Bashneft' Association), working for the first year with respect to the

watch-expeditionary method[1], has assimilated the technique and the technology, the Organization of Labor and drilled more than 40,000 meters. If we consider the labor consumption (depth, number of slottings, removal), then the result is close to the record indexes of the best brigades of the Surgut UBR-2 Administration.

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[1] [Translator's note: By the watch-expeditionary method of operation the crew are transported to the drilling site where they live for extended periods, with periodic return for several days to their permanent residence as in American off-shore drilling.]

FUELS

EXPERIENCE OF SURGUT DRILLING ADMINISTRATION BRIGADE

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian
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[Article by V. I. Volovodov]

[Text] In 1978 the drillers of the Surgut UBR-2 drilled more than 80,000 meters of hole. In the UBR, the preparation for operations in 1978 began with the fact that the administration leader had set a goal for all brigades in the quarter before the beginning of the year -- to reach a drilling level of no less than 75,000 meters. This was not simple, for the index with respect to the Surgutneftegaz Association for one brigade was 35,000 to 40,000 meters. The first meeting was held in the brigade in order to discover the degree of training of the people. Eighty thousand meters turned out to be unattainable. By the next meeting, jointly with the leaders of the drilling operations administration, a list of measures required to do this much drilling was prepared. The developed measures were adopted as the base and approved by the leadership of the association and the main administration.

In the first days of 1978, serious work was started on implementation of these measures. What did they provide for? The basic thrust in the measures was made toward improvement of the organization of operations and technology.

In 1977 in nine months our brigade drilled 53,000 meters which when recalculated for 12 months reached 70,000 meters. It turned out that all possibilities of the workers were exhausted. However, it was necessary to keep looking. Therefore a careful analysis was made of the work of the past year. For these purposes a time budget diagram was constructed for drilling one well with a breakdown by elements. When investigating each element what had been done well and what poorly were compared. The best was also noted. The standard well drilling time budget was constructed and then it was adhered to. If the actual normative drilling time for one well was 16-20 days, then with respect to the standard time budget it came out 7 to 8 days. During the course of drilling the wells the brigade summed up the actual situation daily with the standard which the brigade itself had defined.

The achievement of the high result of 84,200 meters in 1978 is to the credit not only of the drilling brigade, but also the leadership of the UBR, the party, trade union organizations of the administration, and the entire collective which considered the goal of our brigade as their personal goals. The developed measures were supported by everyone, and assistance was given in the organization of the entire drilling operations front. A great deal of support was given to the brigade by the party committee of the Surgutneftgas Association and the city committee of the party during the entire year of 1978.

In November 1978, the goal set for the brigade had in practice been attained -- 80,000 meters had been drilled. If the brigade had not engaged in some exploratory drilling, then by the end of 1978 it could have drilled 92,000 to 95,000 meters. However, having drilled an exploratory well in the north wing outside the outline, the brigade could answer the question of the oil-reserves of this section of the field.

The drilling brigade defined its capabilities and assumed the obligation of drilling 100,000 meters in 1979. This is a very high level and in order to reach it, that is, on the average to give 8400 m/st-month, it is necessary to work without idle time, interruptions or emergencies.

For adjusted, competent operation it is necessary to eliminate the existing interference in the organization of operations and the drilling technology.

It is further necessary to improve the supply with chemical reagents and bits.

The further increase in hole made by the bits and drilling speeds is possible basically as a result of improvement of the work with the drilling mud.

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FUELS

DRILLING CREW EXPERIENCE IN THIRD YEAR OF TENTH FIVE-YEAR PLAN

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian
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[Article by D. M. Nurutdinov]

[Text] In three years of the tenth five year plan the Al-met'yevskoye Drilling Operations Administration has been the winner 10 times in the all-union socialist competition among drilling enterprises. By the results of the work of 1978 the administration was awarded the Challenge Red Banner of the Central Committee of the CPSU, the USSR Council of Ministers, the All-Union Central Trade Union Council and the Central Committee of the All-Union Lenin Young Communist League. Our drilling brigade also deserves a measure of the credit for this progress. Since 1967 it has successfully fulfilled the plans and socialist obligations annually. With a three year plan of the five-year planning period of 78,400 meters the brigade actually drilled 92,700 meters of rock, that is, 14,300 meters more than the plan. These achievements became possible as a result of the application of new equipment and advanced technology. We are using the drills of the AV, AN, ISM, OV series combined with the low-running and propeller type bottom motors and the combination drilling column made of steel and aluminum pipe. This type of composition was developed at the Al'met'yevskoye UBR [Drilling Operations Administration].

The introduction of these measures has in recent years made it possible to increase the hole made per drill by almost 30%. The application of various plugging solutions when controlling complications has reduced the time for controlling these complications by 11.8%.

The achievement of high indexes is to a great extent promoted by the amiable work of the entire collective of the brigade. For many years in our brigade there have been no violators of labor and social discipline and no turnover of personnel.

All members of the brigade participate actively in the social life of the collective. The drillers M. Kh. Sayfullin, P. G. Ryzhikov, P. G. Shaykhutdinov are mentors of the young; electrician M. A. Torgashov is a member of

the drilling committee of the trade union, assistant driller Kamalov is a member of the national monitoring unit. Assistant foreman A. I. Antonov is the partgruporg in the brigade and a member of the natioal monitoring unit, driller G. G. Shaykhutdinov is public inspector with respect to safety engineering.

In the third year of the tenth five year plan the brigade has continued competition with the collectives of adjacent outfits participating in the well construction. Already for the third year in a row we are concluding agreements on labor cooperation with the rig building brigade of L. Ye. Kiselev, the preparation and adjustment brigade of foreman G. I. Gamirov, the mechanized operations inspection of the specialized administration of mechanized operations headed by M. Nurkhametov, the brigade for drilling tool support, the compressor operators brigade foreman F. Karpov, and the group for servicing with drilling water of mechanical engineer N. Myazin.

The competing brigades who have concluded agreements have begun to pay significantly more attention to the performance of the operations which were previously secondary. In turn, the drillers have become more attentive to turning over the equipment to the derrick builders: they turn it over free of dirt, slurry and ice, without breaks and tares in the canvass shelters; the well territory is free of production waste.

The derrick builders are providing for delivery of the units. The planning of the site and installation of the drilling rig are accomplished considering the requirements of the drilling brigade. The preparatory and adjustment brigade is adjusting the derricks for drilling in a timely manner and with high quality of work. The brigade for drilling tool support is outfitting the rigs with drilling tools in a timely manner, placing them on shelves considering the compositions used. The casing and pump-compressor pipe are delivered without interruption.

Thus, each participant in the "flow" is fulfilling his duties better and faster than before, joining of the processes is achieved and the times for performance of these various measures is reduced, and an effort is made not to let down ones comrades.

The results of the socialist competition of the adjacent collectives are summed up once every quarter with respect to the developed conditions. The collectives that are winners receive moral and material incentive. An expanded meeting of representatives of adjacent collectives is held quarterly where we exchange work experience and uncover existing deficiencies.

The means of improving the operation, the interrelations of the rival collectives are planned.

The wages of the drilling brigade workers are organized with respect to a united schedule in accordance with the "drilling-assimilation" cycle.

The bonuses are paid on completion of these operations in time and ahead of time. The competitence and smoothness of all elements of production and the

widely developed competition under the motto "Oil wells for the flow!" have made it possible for our collective to fulfill the plan for three years of the five-year period with respect to drilling on 17 July 1978 and to fulfill the assignments of the third year of the tenth five-year plan ahead of time.

During the year the brigade drilled 310,000 meters of rock with a commercial speed of 2846 m/st-month. The brigade constructed and assimilated 19 wells by its own forces, which is 3 wells more than the plan called for.

In 1978 the time required to complete the operating wells on the average throughout the administration was 39 days, and in the brigades participating in the competition of adjacent collectives, still better results were obtained -- in the brigade of I. S. Davletshin, 31.3 days, R. Z. Zaripov, 31 days, G. P. Kuzin, 30.1 days. The total decrease in the construction times in the brigades competing under the motto "Oil wells for the flow!" was 34.4% as opposed to 1976; on the average with respect to the administration, 24.3%.

In the future the reduction of the construction times will not be so intense, but the reserves have still not been exhausted. It is necessary to reduce the time of bringing in the wells in the concluding phase, including in assimilation, to reduce the idle time of the wells waiting for the geophysicist, to make the work of the brigades in the shops more active with respect to extraction of the petroleum in order to reduce the times for putting the wells into operation.

The brigade collective has assumed socialist obligations with respect to early fulfillment of the assignments of the fourth year of the 10th five year plan. The brigade has obligated itself to fulfill the assignments of the fourth year of the five year plan in three and a half years, to drill and assimilate 16 wells in a year, to save 50,000 rubles of means off the estimated cost, and to lower the time for bringing in each well by 10% by comparison with the plan.

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FUELS

EXPERIENCE OF DRILLING BRIGADE OF UFA DRILLING ADMINISTRATION

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[Article by R. S. Sharipov]

[Text] With respect to the results of 1978, the Bashkiria petroleum workers have been recognized as the winners in the All-Union Socialist Competition and have won the Challenge Red Banner of the Central Committee of the CPSU, the USSR Council of Ministers, the All-Union Central Trade Union Council and the Central Committee of the All-Union Lenin Young Communist League.

The contribution of our drilling brigade also exists in the labor achievements of the Bashkiria petroleum workers.

The year of 1978 was the year of new labor achievements for the brigade. It completed the assignment of three years of the five-year plan first in the republic and it went into the fourth year of the five-year plan on 12 June. In September the brigade became laureate of the Prize imeni Hero of Socialist Labor drilling foreman I. D. Kupriyanov. By the results of 1978 it was again recognized as winner of the All-Union Socialist Competition and for the second year in a row it was awarded the honorary rank of "Best Drilling Brigade of the USSR Ministry of the Petroleum Industry."

By election day of the Supreme Council of the USSR, the brigade had drilled 59,500 meters of rock, 12,000 meters of which counted for 1979. In order to fulfill the plan for the fourth year, it is necessary to drill a total of 2000 meters. In figures we have drilled 29 oil wells, 7 of which are above the three-year plan. As a result of reducing the construction times, the estimated cost of drilling the wells has been reduced significantly. Accordingly, in three years the brigade has saved more than 530,000 rubles. All of the wells put into operation above the three-year plan were drilled by means saved by the brigade itself. In the brigade, along with the veterans working for 20 to 25 years, there are also young workers. The collective is distinguished by constancy of composition. All of them are performing their duties conscientiously.

In the creative selection of the drilling conditions and strict observation of the technology of conducting the drilling operations, there is a guarantee of emergency-free, high-quality drilling of a well. In recent years the brigade has not permitted a single emergency. A great deal of attention is being given to production culture and the observation of safety engineering, as a result of which the brigade is working for the fourth year without an injury.

The transition to the group method of drilling the oil fields has permitted a significant reduction of the well construction time. Of course, the growth of the production indexes of the brigade is promoted by the application of new equipment and technology. The drilling of directional wells by an electric drill with the application of telemetric systems and reducing inserts has been mastered, which under the complicated conditions of the Bashkiria deposits provides a great benefit by comparison with the turbine drilling indexes.

The introduction of new types of series AV bits in combination with the reducing electric drills, the ISM type bits, the powdered clay for preparation for drilling mud, foam cement when cementing the working columns has permitted the brigade to save about 30,000 rubles in 1978.

The labor progress of the brigade has also consisted in organizing socialist competition. All of the structural subdivisions, brigades, watches and workers by professions are competing.

As awards for the winners of the socialist competition, three Challenge Red Banners, five Challenge Red Pennants, and four prizes for the best drilling brigades, three prizes for the best cementing crews have been established. Competition has been organized for the rank of "Best in profession." For this purpose 17 certificates with money prizes have been established. The conditions of socialist competition are being constantly improved. In honor of the 30th anniversary of the victory of World War II, a Prize imeni Hero of the Soviet Union Shakir'yan Giniatullin was founded. This man began his work in 1936 in our collective of the drilling administration and worked in this collective all of his life. This prize is given annually to the auxiliary production collectives for achievement of high technical-economic indexes with respect to the results of the work for the first four months of the year, and it is handed out on victory day. The Prize imeni Hero of Socialist Labor Ivan Dmitriyev Kupriyanov has also been approved. This prize is awarded to the best of the drilling and derrick building brigades and the brigades with respect to assimilation for achievement of the best technical-economic indexes for the period from January to August, and it is handed out on Oil and Gas Industry Workers Day.

For the spread of advanced work experience, the achievements of the innovators and the winners of socialist competition, multiple-circulation, republic and municipal newspapers are used and also the Baskir radio and the Ufa television studio.

Forms of experience exchange such as holding "Foreman's Day" and the advanced experience schools have also become widespread in the administration. The first of them have been organized in the rayon engineering-technological services, and the drillers working under the same conditions participate in them. "Foreman's Day" ends with a trip to the drilling project, the foreman of which tells about his experience.

The advanced experience schools are held by the results of the first six months and year in the collective reaching the highest indexes in work. They are participated in by the drilling foremen and the chief specialists of the administration and also the representatives from other administrations of the drilling operations and the Bashnef' association.

The publicity of the competition, the propagation of the achievements of the advanced workers in socialist competition have promoted improvement of the productivity of labor in the lagging collectives.

For realization of the program of the 10th five year plan there are problems, the solution of which depends on the Ministry of the Petroleum Industry. It is necessary to convert all the wells to electric drilling considering that under the complications of Bashkiria this procedure is more efficient than turbine drilling.

However, the growth of the volumes of drilling by an electric drill is held up as a result of shortages of the electric drills themselves. Up to now the problem of the stabilizing devices for drilling the rectilinear sections of the well in directional wells has not been solved. The instruments available in the geophysical service for monitoring the profile of the directional wells do not insure the required accuracy of the measurements, as a result of which there are significant complications of the well profiles.

The administration long ago began to raise the cement for an operating well to the head, which for great depths is a labor-consuming process. For cementing the columns, light plugging cements or a simplified cementing process is needed.

The drilling brigades are not provided with instruments to monitor the drilling conditions. Instruments are needed which will indicate and record the mechanical speed of drilling, the flow rate of the drilling mud pumped into the well and leaving it and will indicate the parameters of the drilling mud.

The performance of geophysical research in the drilling process does not satisfy the drillers. The expenditures of time and the volume of logging operations are increasing with each year.

The solution of these problems will make it possible to achieve better results in the work of the drillers.

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FUELS

EXPERIENCE OF KOMSOMOL DRILLING BRIGADE OF UNINSKIY DRILLING TRUST

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian No 8, Aug 79 pp 29-30

[Article by S. V. Melekhin]

[Text] The drilling brigade which I have been head of since 1968 was awarded the rank of komsomol-youth brigade in 1976.

In the last three years the brigade has drilled operating wells in the Vozeyskoye oil field.

The members of the brigade live at the rig in trailer houses which are moved together with the rig when moving to a new location. The work is done in three shifts of 8 hours each (22 to 24 days a month); one shift rests for 8 days with a trip to the location of his permanent residence.

On 24 April 1978 the brigade completed the three-year production assignment, having drilled 26,700 meters of rock, and in the three years of the tenth five-year plan the brigade drilled 36,100 meters.

The average depth of the wells drilled by the brigade in the three years was 3276 meters; the following technical-economic indexes were achieved (see the table).

The brigade constantly uses in its work the advanced experience, the new technical achievements and advanced well drilling technology. An important role in the achievement of high technical-economic indexes when drilling is played by the efficiency expert work of the brigade members. In three years nine efficiency proposals have been submitted with a provisional annual savings of 5652 rubles.

The brigade works in practice without emergencies. This is achieved by high production discipline of the brigade members and also stable performance of measures with respect to preventing blowout of the wells and observation of the technological regulations with respect to well blowouts.

Indexes	1976		1977		1978	
	with respect to brigade	with respect to UBR	with respect to brigade	with respect to UBR	with respect to brigade	with respect to UBR
Number of completed wells	3		4		4	
Hole made in a year, m						
plan	9000		8700		9000	
socialist obligation	10500		9700		9700	
actual	11834	8962	11074	7699	13129	9759
Commercial speed, m/st-month						
plan	783		791		833	
actual	1245	933	1142	869	1443	1059
Time budget, %						
production time	93.1	83.6	87.1	77.4	95.5	80.8
emergency and rejects	3.3	9.4	2.4	12.6	2.2	6.8
organized idle time	2.6	2.9	2.3	3.4	1.1	6.7
repairs	1.0	4.1	1.2	4.6	1.2	5.7
Consumption of bits per well	59		39		31	
Construction cycle, days	136.4	133.2	151.9	100.7	110.7	98.0
derrick building	20.8	33.7	24.2	14	14.3	21.4
drilling	102.9	99.0	116.0	77	86.3	69.2
testing	12.7	8.6	11.7	9.8	10.1	7.4
Savings for the year, thousands of rubles	480		333		520	

A significant role in the reduction of the repair time and improvement of the servicing of the drilling rig is played by the fact that a drilling rig is attached to a brigade which which the brigade is moved strictly through a series of drilling sites. In three years the brigade has been transferred to a new rig only one time.

The maximum attained commercial drilling speed of wells in the Vozeyskaya area was 1735 m/st-month when drilling well No 687.

For a further increase in well drilling speeds and reduction of the construction cycle, in our opinion, the following are necessary:

Reduction of the time for tearing down and setting up the derricks to 5-6 days;

Improvement of the quality of the purification of the drilling muds as a result of providing vibration screens and sand separators of more reliable and efficient designs and also as a result of improvement and complete supply of screens and spare parts for the vibration screens and sand separators of the existing designs;

Advanced construction of waterlines and overhead electric power lines for the drilling needs, relieving the drilling crews of this labor consuming and important work;

Better supply of technological transportation;

Insurance of high-strength drill pipe and casing which makes it possible to increase the drilling speed after lowering the technical columns as a result of conversion to the rotary method of drilling.

The performance of the indicated measures will permit an increase in drilling speed by 20-30% and it will bring the hole made per brigade per year to 15,000 to 16,000 meters.

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FUELS

DRILLING BRIGADE EXPERIENCE IN WESTERN SIBERIA

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian No 8, Aug 79 pp 30-31

[Article by T. K. Kinzebulatov]

[Text] In the next ten years a decisive role in the provision of the country with fuel and power will be retained by oil and gas, the greater part of which will be extracted in Western Siberia.

The Bashkiria drillers, including our drilling brigade are participating in the solution of this very important problem.

The drilling of wells in the Savuyskoye oil field began at the beginning of 1978. In the shortest possible time it was necessary to master a type of drilling rig that was new to us, the process of directional drilling in entirely new geological conditions, and the watch-expeditionary method of operations.

The first well was drilled by the brigade in more than a month, but in the second half of 1978 two wells 2500 meters deep each were completed in a month.

In 1978 two bunches of 15 wells were completed; of them 13 were completed with acceleration as opposed to the normative times. Ten wells were put into operation with an average flow of more than 100 tons per day.

Engaging in socialist competition in response to the call of the drilling brigade of foreman V. A. Nikerin for achievement of 40,000 meters of hole per brigade in 1978, the brigade collective drilled 40,800 meters of rock. The commercial speed was 4089 meters/st-month.

This progress was made as a result of the smooth work of the brigade collective and constant assistance of the drillers, technologists, derrick builders and other services of the Surgutneft' Association and the Al'met'yevskoye Drilling Operations Administration.

Calculating the possibilities, our brigade issued a call to all drillers working by the watch-expeditionary method in Western Siberia to achieve an annual drilling rate of 50,000 meters for each brigade.

In 1978, we were unable to make complete use of everything that was best in the technology and organization of the operations of the advanced brigades of Glavtyumenneftegaz in our work.

In addition, internal reserves were not utilized. Our brigade alone was idle waiting for finished drilling tooles for 24 days, that is, it lost about 4000 meters of hole. The organizational idle time of the brigade was 14 days with an additional loss of 2500 meters as a result of poor operation of transportation, suplliers, geophysicists, plugging specialists and the production service base.

The watch-expeditionary method of operation is becoming more and more widespread.

The workers of our brigades are living at 28 populated areas in Bashkiria. It is necessary to take various forms of transportation to reach the assembly point (Ufa). There is not one brigade with its members living in the same place. Frequently the departure schedules are interrupted by bad weather or absence of fuel to fuel the aircraft. For example, in January 1979 there were 27 flight delays from Sergut, and in February there were 19. All of this creates defined difficulties for the workers by the watch-expeditionary method. Our brigades worked 2/3 of the calendar year in Western Siberia. Therefore it is necessary to solve the problems of daily living and eating possibly by creating special worker settlements in which there would be everything that is needed for this purpose. Not all of the engineering and technical workers are working by the watch method (the leader, the main specialist, the chiefs of the TsITS, RITS and BPO). It appears to us that it is necessary to allocate living space and places in the childrens institutions for the involved Drilling Operations Administrations in Surgut.

The collectives of the drilling brigades working by the watch-expeditionary method understands the goals facing them to work more persistently on increasing the productivity of labor and quality of work; they are applying every effort to meeth their socialist obligations.

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FUELS

EXPERIENCE OF DERRICK BUILDING BRIGADE OF NEFTEYUGANSKOYE VMU

Moscow ORGANIZATSIYA I UPRAVLENIYE NEFTYANOY PROMYSHLENNOSTI in Russian No 8, Aug 79 pp 31-32

[Article by Z. F. Mikhtafov]

[Text] The collective of our brigade has been the winner more than once in the intrashop, oblast and all-union socialist competition. By the results of 1978 the brigade was awarded the rank of "Best in profession." In that year the profit from the performed operations was fed 12,000 rubles. The complete construction cycle of one drilling site was reduced by 0.7 days. Whereas on the average throughout the derrick building administration [VMU] one brigade built 58.6 rigs, our brigade turned over 72 rigs; of them more than 95% were rated good and excellent. The plan for three years of the 10th five year plan was fulfilled by the brigade on 8 September 1978.

In 1978 the brigade took the course of fast construction of the drilling rigs by the brigade contract method; as a result 10 groups were constructed ahead of time.

The basic operating indexes of the brigade are presented in the table.

The best developments of the technological division of the administration are being introduced in the brigade. In 1978 a proposal was introduced with respect to the application of rolling dollies on rubber running gear to move the derrick unit in assembled form over a concrete road which made it possible to save a large amount of work time, and by the calculations of the specialists, provided a savings in the amount of 19,600 rubles. A number of units and other improvements have also been introduced.

A great deal of attention is being given to the training of the personnel and improvement of their qualifications. The brigade is a school of advanced labor techniques in which the achievements and experience are transmitted to

the workers of other brigades. The achieved indexes can be improved if we eliminate the difficulties in our operation.

Indexes	1978		
	plan	actual	percentage ratio
Completed construction and installation of drilling rig including groups	54 8	62 9	114.8 112.5
Volume of performed operations with respect to turned over rigs, thousands of rubles	1240	1449	116.9
Cost of perfomred operations with respect to turned over rigs as opposed to planned cost, thousands of rubles	1319	1137	86.2
Cost of construction on the average for one rig (estimated, actual), rubles	23371	18339	78.5
Duration of construction with respect to complete cycle on the average for one rig, days	6.3	5.6	88.9
Construction and installation on the average for one rig, days	5.4	4.8	88.9
Duration of construction of a group rig with respect to complete cycle, days	22.6	21.3	--
Performance by inhouse forces, rubles per worker	29714	35297	118.8

Frequently the drillers drilling a group of wells do not prepare the rigs for dismantling and moving. Sometimes it is necessary literally to tear the equipment out of the ice and slurry. In this case frequently the equipment is broken and a great deal of time is spent on repairing it.

The drillers as customers are obligated to show concern for timely preparation of routes and sites, but in many cases this is considered secondary, and this creates improbable difficulties for the derrick builders at times forced to take frequently unjustified risks.

With each year the drilling and derrick building plans are increasing. However, the increased assignments are not always founded on a solid material base. Idle time is frequent as a result of absence of the required materials, metal and sets of equipment.

It is possible to level many claims against the transportation people. Frequently tractors and cranes are sent out which do not correspond with

respect to technical conditions to the safety engineering norms. There are cases of delays and untimely arrival of buses or the crew vehicle.

Up to now the problem of running the electric power lines before the beginning of the installation of a group rig has not been solved, as a result of which there is no possibility of using the KTPN-160/6 electric power plant in place of theportable diesel electric power plants. The application of the KTPN-160/6 in the installation of the drilling rig provides a savings for one installation of a group rig of about 8000 rubles, and reckoned for the year, more than 500,000 rubles, and it also saves manpower.

The success of the matter is decided by the people, but the returns from labor depend to a high degree on the organization of the daily routine. The solution of the urgent problems will insure that the derrick building brigade will fulfill all of the stated goals.

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