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29 July 1981

East Europe Report

ECONOMIC AND INDUSTRIAL AFFAIRS

(FOUO 7/81)

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EAST EUROPE REPORT
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INTERNATIONAL AFFAIRS

PARTICIPATION IN CEMA MACHINE BUILDING INDUSTRY REFLECTS NEGATIVE SIGNS

Sofia IKONOMICHESKA MISUL in Bulgarian No 2, 1981 pp 26-36

[Article by Vasil Kalchev and Mariana Vitkova: "Bulgaria's Participation in International Production Specialization and Cooperation in Machine Building"]

[Text] International production specialization and cooperation (MSKP) is one of the basic forms of foreign economic relations which expresses the development of integration processes among CEMA-member countries. It is an essential feature of the international socialist division of labor in the course of its practical implementation as the economic foundation of socialist integration.

International product specialization and cooperation is a comprehensive form of cooperation and integration which applies mainly to the production area. Its description as nothing but a form of production integration, however, would be incomplete. It has a major impact on trade and is achieved through the foreign economic exchange of commodity-material values among CEMA-member countries. The effect of the MSKP on market relations follows the direction of increasing their stability and their long term and reciprocally profitable nature. That is why the development of production specialization and cooperation processes is a major prerequisite in improving the international socialist marketplace. Furthermore, conditions of the international market are an important element of the practical implementation of the MSKP. They could stimulate the development of its processes but may plan a restraining role as well.

The assessment which could be made of the level of development reached by the MSKP should be linked above all to its influence on the national reproduction process. Obviously, in the case of smaller countries, which include the Bulgarian People's Republic, this influence is relatively higher. Indeed, the 230 agreements for MSKP, which our country has concluded on a multilateral and bilateral basis with CEMA-member countries, largely determine its economic specializations. On the basis of such agreements Bulgaria has specialized in the production of more than 700 types of machine building goods and of many items in other industrial and agricultural sectors.

The permanent geographic characteristics of Bulgarian foreign trade, whose main exports (from 76 to 78 percent for the 1970-1979 period) go to CEMA-member countries and which, in turn, accounts for the predominant share of Bulgarian imports (from 71 to 80 percent for the 1970-1979 period) is becoming increasingly related to this specialization.¹

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For the growing interdependence between the development of the Bulgarian economy and its participation in the process of the international socialist division of labor is confirmed also by the ratio between the value amounts of foreign trade with CEMA-member countries, including the USSR, and the country's national income. Whereas this ratio equalled 31.7 percent in 1970, including 22.6 percent with the USSR, it reached 64.3 and 46.6 percent, respectively, in 1978.²

The share of machine building items predominates in the overall exports of specialized and cooperated items produced by our country, accounting for more than 90 percent of the total. Some basic production lines of specialization in machine building are of essential significance: hoisting facilities, electronic and electrical engineering goods, metal cutting machinery, tractors and agricultural machinery. The basic indicators of their role in the national economy is the relative share of exports of such goods in the overall volume of their output. In recent years, it has exceeded 80 percent for electric motors, electric hoists, fork lift trucks and tractors, and more than 90 percent for typewriters and gas operated lift trucks.³ More than one-third of Bulgaria's overall exports of machines and equipment are machine building goods produced on the basis of bilateral and multilateral specialization (including more than 45 percent of machines which are exported to CEMA-member countries). These data are indicative of the major role of international specialization and cooperation with CEMA-member countries in the development of the Bulgarian economy, including Bulgarian foreign trade.

Bulgaria's active participation in the MSKP is the result mainly of the highly dynamic development of machine building output and exports. Thus, between 1960 and 1978, the production of machines and equipment in Bulgaria rose at an average annual rate of 13.2 percent, while export to CEMA-member countries rose by 33.4 percent.⁴ The dynamic development of exports of specialized items contributed to the reaching of such a high pace of machine building exports. This was particularly characteristic of the 1970s, when such exports increased by a factor of roughly 7; in other words, it increased at a faster pace than that of machine building output of CEMA-member countries.⁵

The structure of exports of specialized goods is improving along with the development of its highly dynamic nature. The share of goods produced by the electronic and electrical engineering industry has increased while that of more material-intensive specialized items included in the production of lifting-transportation machinery, transport facilities and agricultural machinery, correspondingly declined. Between 1970 and 1979 the share of electronic computers in the overall volume of exports of specialized machines and equipment for industrial purposes rose from 0.6 to 21.2 percent; of electrical engineering machines, from 0.3 to 6.9 percent; and of communications equipment, from 0.3 to 6.8 percent. Within the same period, the share of hoisting-transport machinery declined from 65.5 to 42.3 percent; of tractors and agricultural machinery, from 22.1 to 5.8 percent; and of transport facilities, from 10.3 to 7.6 percent.⁶

This brief generalized study shows that good results were achieved in the development of MSKP processes and in our participation in them in the 1970s. The task now is to consolidate the successes and raise the MSKP to a qualitatively new level. We can reasonably expect that the period through 1990 and through the end of the century will be characterized mainly by the development and intensification of the MSKP in the area

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of reciprocal cooperation with CEMA-member countries. What will the position of our country be and what will be the main directions of its future participation in this process? In this respect the elaboration of a scientific concept on the further involvement of the country within the MSKP is of major importance. The considerations which we shall express here are related to the long-term elaboration of this concept, whose detailed development must be taken up by a large group of scientific workers and practical specialists.⁷

Production (including social) and foreign trade factors must be considered in the development of this concept. The most important among the production factors are available domestic material resources; the condition of the manpower balance (labor skills, trends in wages and incentives, and others); the established production base and its utilization (including problems of its long-term development, modernization and reconstruction); scientific and technical support for participation in MSKP, which presumes giving priority to the development of scientific and technical progress sectors directly related to the areas in which our country is specializing; and the domestic needs of the country for a specific commodity.

The following foreign trade factors are determining: existence of a permanent need by CEMA-member countries for goods in which we are specializing; availability of a large and stable market, which presumes extensive foreign trade studies for the substantiation of each suggestion for MSKP; high export effectiveness of the goods in which a country is specializing or cooperating along the line of CEMA or on a bilateral basis; possibilities of importing material resources lacking in the country (raw materials, fuels, materials, investment equipment and others, including a breakdown by country), and others.

The directions of the long-term participation of the country in the MSKP must be defined in accordance with the comprehensive influence of industrial and foreign trade factors.

In this connection, we must begin by determining the lines and products of specialization of the country. We believe this to be a problem related mainly to our production possibilities (developed capacities, available resources and others). It is essentially on the basis of this criterion that the tendency to undertake a large number of international specializations is developing in our practical work, many of which remain unimplemented or else are carried out unsatisfactorily. With such an approach a smaller country cannot utilize the advantages offered by the MSKP related to production concentration and improvements in technical and economic indicators. In the final account, this makes the producers lose interest and yields unsatisfactory foreign trade results.

The rough assessments which some authors in socialist countries have made⁸ indicate that currently the level of concentration and international specialization of some items produced by CEMA-member countries remains inadequate. The rationalization of the machine building structure on a national scale has not been completed and a great variety of goods are still being produced; a certain lack of coordination exists between scientific research and technical development; items the production facilities for which remain insufficiently developed are still being included in a substantial number of specialization and cooperation contracts, as a result of which they account for an insignificant amount of the overall machine building output exported by the individual countries.

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The study of our practical experience in reciprocal cooperation indicates the continuing existence of cases of partial or total nonfulfillment of stipulations on the export of specialized machines, in terms of volume and variety, violations of coordinated delivery agreements, mainly in terms of delays, unrhythmical deliveries of specialized goods and spare parts to consumers, deliveries of goods inconsistent with coordinated quality indicators, slow technical renovation of offered specialized goods, and so on. Such phenomena may be frequently found in our work as well.

As we pointed out, when one or another direction is chosen for the participation of our country in the MSKP, along with the objective assessment of real production opportunities we must consider mandatory foreign trade criteria such as expected effectiveness from the export of specialized goods; need for additional imports of raw materials, fuels and materials; facilities for the reconstruction and modernization of existing production capacities on a modern technical level and the building of new ones (under our circumstances this is related to imports of investment equipment which is in short supply on the international socialist market) and others. In this connection the formulation of a reliable method with which to determine the effectiveness of participation in the MSKP is an important task. The study of the methods and indicators used in our practices for the determination of this effectiveness has indicated the insufficiently representative nature of the result, the mixing and double consideration of results in the industrial and foreign trade areas and others.

The interconnection between the development of the Bulgarian economy and the process of international socialist division of labor covers all the stages of the reproduction process to a rising extent. That is why the foreign trade intensification indicators alone would be insufficient for the purpose of assessing the extent of participation of the country in the international socialist division of labor and the intensiveness of its foreign economic relations. We must make an increasingly extensive use of indicators which equalize the level of concentration and the extent of international specialization in the manufacturing of individual commodities. In this respect it is difficult to achieve precise international comparisons, for the process of concentration is affected by a variety of factors. In most CEMA-member countries, however, including Bulgaria, currently only individual types of specialized output can reach optimum dimensions in terms of their volume on an international scale. The inevitable conclusion is that we require further concentration of resources and the undertaking of broad scale specialization based on the integrated market of CEMA-member countries, the USSR market essentially.

Another important problem is that of the choice of the form and type of the chosen production specialization. Our country's experience indicates that "traditional" item specialization in the production of finished goods has become most extensively developed. It has the advantage of providing relatively extensive opportunities for flexibility in commodity marketing. Obviously, the other CEMA-member countries as well operate on this basis in choosing their form of participation in the MSKP. Furthermore, both publications and written materials of CEMA agencies quite justifiably indicate the negative consequences of the existing parallelism in the production activities of individual countries. This limits the possibility of using the advantages of the international production concentration as a factor for upgrading its effectiveness considerably.

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The historical approach to the evolution of the global socialist system, however, shows that under the conditions in which most CEMA-member countries are developing their own national economic complexes and in the absence of an integration system for controlling the international socialist division of labor, production duplication is inevitable. Furthermore, it is precisely the existing duplication on the macro level which could and should become the base on which integration processes within the individual material production sectors of CEMA-member countries could develop in the future on a highly effective basis. This can only be achieved through the extensive development of international production cooperation.

We know that in order for two or more countries to cooperate in production they must have developed their respective production sectors or lines. This is a question of a type of future development which would use the already developed structures and, at the same time, adapt production capacities to the requirements for close industrial cooperation with the other countries. In other words, from a specifically national production it must become integrated, highly effective and optimized. The current inadequate development of cooperation relations among CEMA-member countries is consistent with the initial stage of integration in which they are. The future belongs to international socialist cooperation, which will be developed on the basis of parallel production capacities in individual CEMA-member countries. The extensive development and utilization of the advantages of international production cooperation⁹ requires a coordination of the structural quality of each individual country as a basis for the establishment of profound and lasting relations in individual material production sectors. Clearly the currently used mechanism which controls and regulates international cooperation should have to be improved as well with a view to ensuring the active stimulation of this process, taking into consideration the long-term nature of such cooperation and stability and reciprocal advantage requirements.

The creation of the necessary prerequisites for the extensive development of production cooperation with CEMA-member countries must be undertaken firmly and on a broad scale in order to surmount the situation, abnormal in our view, in which the assemblies and parts which CEMA-member countries currently trade among themselves account for less than one-fifth of the volume of the specialized output. That is why the question of Bulgaria's position in the process of international socialist production cooperation is quite important. The isolated examples of our participation in cooperation with CEMA-member countries have indicated a more or less one-sided direction in which we supply assemblies and parts which are put together in other countries. Effectiveness requirements are also related to the study of opportunities and the promotion of initiatives for the organization of assembly work and the production of finished goods in our country. This is based on the consideration that it is more advantageous to produce some types by countries with better resources (metal mainly). This particularly applies to our cooperation with the USSR from which, instead of metal, it would be obviously more advantageous from the viewpoint of transportation expenditures to procure metal intensive assemblies and parts.¹⁰ However, this does not exclude our further participation in international production cooperation through deliveries of complementing items, assemblies and parts. In this area requirements concerning quality will be rising steadily. This will demand the use of most advanced technologies and technical solutions, including those which must be procured from the capitalist countries. Hence the need to develop in our country such specialized production capacities involving the financial participation of interested CEMA-member countries. Such participation could be achieved through the

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opportunities offered by cooperation in joint deliveries of finished products, including shipments to capitalist markets.

The problem of the structure (variety) of specialized items which are exported and imported is related to the choice of directions in participation in the MSKP. In such cases the conditions of our country presume, along with the requirements of general national economic and foreign trade effectiveness, the giving of priority to variants which are relatively less material and energy intensive. It is precisely such sectors and production facilities that should shape the future integration aspect of our economy. The country's structural policy should be based on the faster development of the production and export of computer and office equipment, electronic elements, industrial radioelectronics, instruments and means of automation and other electronic and electrical engineering products in which our participation in the MSKP with CEMA-member countries would be concentrated.

Studies have indicated that currently Bulgaria has one of the highest material intensiveness (metal intensiveness) per one million rubles of machine building output among all CEMA-member countries. Difficulties in future procurements of raw materials, fuels and materials require that the share of lifting-transport machine building be gradually reduced in the export structure of our machine-building industry¹¹ regardless of its good export indicators. We must also improve quality indicators and make efforts to lower metal expenditures per unit of foreign exchange income from lifting equipment exports.

The possibility of developing new specialization and cooperation areas by assemblies and parts within the framework of the already developed general specialization in a given area offers substantial opportunities for the intensification of our export of specialized items. It is a question of diversifying specialized goods and broadening the range of specific goods produced (aimed at eventually covering the entire range of parameters). This is particularly important in terms of the renovation and modernization of specialized commodities, with a view to taking achievements into consideration and quickly applying the results of scientific and technical progress.

Opportunities for expanding the export of such goods exist in our newly developed items which still remain outside the MSKP with CEMA-member countries. This includes the production of nonstandard equipment, heavy investment machine building and robot manufacturing. The production of trucks will offer opportunities for the establishment of cooperation relations in the years to come.

In choosing the directions of imports of specialized commodities we must give priority (taking into consideration the economic interests of our partners) to relatively less material intensive production facilities, to goods considered carriers of technical progress and to high quality and one-of-a-kind machine building goods whose production cannot be mastered by our country or else involves high expenditures. In practical terms, this means that we must determine our import needs accurately and intensify the participation of foreign trade organizations which must provide studies of the market situation and trends in the development of international markets, suggestions for imports, including imports through the MSKP system, and others.

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The territorial aspects related to the choice of the country with which we must specialize and cooperate in the production of specific items is of great importance in determining the directions of our future participation in MSKP in the area of machine building. Data from the development of the MSKP so far reveal an interesting pattern in our reciprocal imports and exports of specialized items. In the case of the USSR, bilateral specialization and cooperation accounts for a considerable share of the total; with the other CEMA-member countries multilateral imports and exports dominate (with a general trend toward increasing the share of multilateral specialized output).¹² This pattern is explained by the generally higher level of our bilateral relations with the USSR and the special attention which both countries pay to the evolvment of comprehensive cooperation and rapprochement. This process is objectively based on the powerful complex of the USSR which enables smaller countries to optimize their production through the evolvment of their specialization and cooperation mainly with the USSR.¹³

Bilateral specialization and cooperation with the USSR will continue its rising influence in the future. The main strategic directions were defined in the general plan for specialization and cooperation in basic material production sectors through 1990. Along with bilateral cooperation with the USSR, in the course of improvements in CEMA activities and of the development of socialist integration, the significance of multilateral forms, i.e., of multilateral MSKP, will continue to rise. Under such circumstances, substantiations for bilateral offers and contracts for MSKP with individual CEMA-member countries (excluding the USSR) will become stricter. Bulgaria should proceed from the possibilities of the markets of the individual CEMA-member countries and of cooperating with such countries in exports to third markets; the results achieved by the corresponding country in the development of a given item and its scientific and technical potential in this area (including the technical standards of output, possibility of joint licensing and others); possibilities of joint procurement of resources for the production of specialized items; and the overall condition of bilateral trade and payment relations.

Generally speaking, the promising ways of participation of our country in the MSKP on a multilateral basis through 1990 are related to the implementation of the long term target program for cooperation (DTsPS) in machine building. Its 12 subprograms include more than 100 specific measures, one-third of which deal with production specialization and cooperation while the remainder are related to the development of new production capacities, scientific and technical cooperation and standardization. The DTsPS calls for the intensification of intra-sectorial specialization in machine building, above all, with its ever more efficient expansion in terms of assembly, part and technological specialization and, on this basis, expanded cooperation in the production of machine building items. Such a development of the most progressive forms of division of labor among CEMA-member countries faces our participation in the MSKP with serious requirements. Its results should be the following:

Increasing the possibilities of machine building in terms of the acceleration of scientific and technical progress, based on intensive scientific and technical and industrial cooperation among CEMA-member countries;

Enhancing the role of machine building as a basis for raising the technical standard and effectiveness of the most important economic sectors. Under our circumstances this is related to the development of machine building at a faster rate;

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Increasing the volume of machine building output within the framework of CEMA by a factor of two between 1981 and 1985 and by a factor of three between 1986 and 1990 compared with the current five-year plan.¹⁴ This raises important requirements related to upgrading the quality indicators of our specialized output;

Increasing production concentration and reducing the variety of specialized goods while, at the same time, expanding MSKP processes to new sectors and items.

The implementation of measures coordinated with a DTsPS takes place under the conditions of the increasingly long-term nature of reciprocal industrial and scientific and technical cooperation and of the enhanced role of the economic approach in the solution of basic national economic problems. These are the factors which will have an increasing influence on and formulate new requirements regarding the comprehensive improvement of production cooperation and specialization processes, an important element of which are reciprocal procurements of specialized and cooperated items.

One of the means for stimulating Bulgarian participation in the MSKP is the ever more extensive use of the program-target and comprehensive approach to the MSKP control mechanism. In this connection, under the conditions of the DTsPS, the following basic features must be taken into consideration:

First, we must ensure a growing material interest on the part of economic organizations to participate in and strictly meet their obligations based on international contracts, through the ever fuller utilization of the economic approach in foreign economic activities. This means to stimulate the initiative and to upgrade the responsibility of all industrial and foreign trade units in the fulfillment of international obligations.

Second, the development of an economic interest in taking steadily into consideration the specific requirements of the international market and the material responsibility of the organizations which are parties to contracts for international production specialization and which must take into consideration the stricter requirements of this market in terms of the marketing of their commodities and stimulate their quality improvements more effectively. For this reason it would be expedient for the amount of export bonuses to be made more flexible and dependent on the results of a comparative analysis of technical and economic data of an item produced domestically and its foreign counterparts and take more fully into consideration the effectiveness of outlays related to quality improvements.

Third, we must intensify the role of material liabilities for violation of contractual obligations on the part of foreign trade organizations in charge of marketing operatively produced items.

Fourth, the long range nature of the DTsPS will result in formulation of stricter requirements regarding established forms of planning and implementation of foreign economic relations and related to reciprocal procurement of specialized and cooperated goods on a long-term basis, and stricter requirements concerning the quality and constant technical updating of commodities.

Prices and price setting are important problems in terms of the long range development of the MSKP. Prices for specialized and cooperated items are set on the basis of the joint price setting principles and methods adopted at the Ninth CEMA Session (1968). According to its method contractual prices, including those of the MSKP,

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are based on prices charged at the main commodity markets in the world. This price setting method, applied to goods subjected to MSKP contracts, has its advantages and shortcomings. Its advantages are the following:

1. General proportions regarding exchange and equivalency of trade are assured through the utilization of a uniform approach. Different quantities and shares of specialized items in the exports of individual countries make it necessary to cover the trade balance from trade in specialized items with conventional trading items. Similarly, the positive balance is used to cover general obligations to countries participating in the multilateral system of payments. Our country has a positive balance from trade in specialized items. This circumstance is important in determining its interest in the use of uniform price setting principles. Also along this line is the requirement that annual changes in contractual prices (adopted with a resolution passed at the 70th meeting of the CEMA Executive Committee) apply to specialized and cooperated goods as well;
2. A no less important circumstance is the fact that prices on international markets are an objective criterion for the adoption of effective alternatives for the development of production forces and for the participation of the country in the MSKP. This criterion is used by the other CEMA-member countries as well and this uniform approach is of equal importance in this case;
3. As a whole, these prices encourage the use of the achievements of scientific and technical progress and the enhancement of the quality characteristics of goods which are subject to the MSKP;
4. Another important circumstance is that the CEMA-member countries are focussing to a rising extent on the adaptation of their economies to the requirements of the international markets. To this effect their domestic prices are beginning to be tied to the prices charged on these markets in varying degrees.

The shortcomings of this price setting system include difficulties in the choice of a representative price (because of the great variety in machine building output and the differentiation in technical and economic parameters), as well as difficulties which have to do with price correlations among different machines and equipment which make the production of a given machine advantageous to all CEMA-member countries and that of another, unprofitable. This could hold back MSKP processes. The negative effect of this factor can be surmounted by increasing the level of planned interaction, in the course of which the specialization of each CEMA-member country is determined jointly.

Despite the existence of some shortcomings in item specialization, it would be expedient to retain the current price setting principles also because of the fact that the use of global prices as a basis essentially rests on the level of specialization characteristic of leading companies in a given area.

The problem of price setting in international production cooperation has very specific features. It helps to create a relatively autonomous system for the exchange of assemblies and parts for the finished goods made of them. Consequently, the problem here is typing the prices of assemblies and parts to those of the finished good. The creation of a functional tie between these two types of prices will provide the

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necessary prerequisites for the surmounting of eventual contradictions between the possibilities of profiting from the various advantages offered by the MSKP for the producers of assemblies and parts and the producers of finished goods. This will stimulate the development of international production cooperation. A number of methods may be used in the establishment of such functional relations: the normative method, the method of breaking down the world price of a given commodity, the method of percentages and others. In current price setting practices, the breakdown method is preferable. In this case the price of the finished good is strictly based on its international price.

The price setting of spare parts has its specific features as well. The problem of ensuring the availability of a sufficient volume and variety of spare parts for specialized machine building items traded among the countries is becoming a serious factor which restricts the development of the MSKP. Its solution depends largely on the setting of prices (in accordance with world practices) at a higher level compared to the corresponding assemblies and parts of which the finished item consists.

The economic considerations for this are related, above all, to the fact that the expenditures incurred by producers of spare parts are, as a rule, considerably higher. Given the current price setting principles, however, they are not taken into consideration. This does not stimulate the solution of this topical problem. The higher expenditures incurred by the producers are mainly the result of objective reasons. They are caused by the production of small series of spare parts by non-specialized enterprises (particularly after a given model is no longer produced), additional warehousing costs, special packaging, and so on. In our view, such expenditures should be recognized on the international socialist market as socially necessary labor outlays and be expressed in relatively higher prices of spare parts for specialized machines and equipment compared with prices of similar complementing assemblies and parts.

Signed to press on 18 December 1980.

FOOTNOTES

1. Computed on the basis of data of "Statisticheski Spravochnik" [Statistical Reference Book], 1980, p 35; "Vunshna Turgoviya na NRB" [Foreign Trade of the Bulgarian People's Republic], 1980, pp 30-32, 34.
2. Computed from "Vunshna Turgoviya na NRB," 1980, p 34.
3. Computed from "Vunshna Turgoviya na NRB," 1980, pp 48-63; "Statisticheski Spravochnik," 1980, pp 100-102.
4. "Ekonomicheskoye Sotrudychestvo Stran-Chlenov SEV" [Economic Cooperation Among SEMA-Member Countries], Moscow, 1980, p 62.
5. Computed from "Vunshna Turgoviya na NRB," 1980, p 26.
6. Computed from "Vunshna Turgoviya na NRB," 1980, p 27.

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7. Senior Scientific Associate St. Stoilov has made a successful attempt in describing the long term trends of our participation in the MSKP in the collective monograph, "Mezhdunarodna Spetsializatsiya na Proizvodstvoto. Vuprosi na Efektivnostta" [International Production Specialization. Problems of Effectiveness], Partizdat, Sofia, 1978.
8. K. Morgenshtern, "International Production Specialization and Its Concentration in CEMA-Member Countries," VOPROSY EKONOMIKI, No 2, 1978; Ye. Karlik and Yu. Kormnov, "Production Concentration and Specialization in CEMA-Member Countries," VOPROSY EKONOMIKI, No 8, 1980.
9. Speaking most generally, these advantages are related to the concentration and organization of the production process on an optimal scale, the establishment of stable production and technological relations among partners, with standardization of requirements concerning the quality of output, joint scientific and technical and development activities, joint trading on third markets and others.
10. "Mezhdunarodna Spetsializatsiya na Proizvodstvoto. Vuprosi na Efektivnostta" [International Production Specialization. Problems of Effectiveness], Partizdat, Sofia, 1978, p 53.
11. Exports of hoisting-transportation machinery will continue to grow in terms of absolute volumes. This makes topical the problem of improving their internal structure. In our view, we must increase in the future the share of complete systems for intra-plant transportation, based on individually designed systems. This will considerably improve foreign trade results and lower metal intensiveness.
12. These computations apply only to machine building goods whose production has been specialized on the basis of contracts. This criterion (the existence of a contract for MSKP) is used regardless of its insufficiently representative nature ("NRB v Mezhdunarodnoto Ikonomichesko Sutrudnichestvo i Sotsialisticheska Integratsiya" [The Bulgarian People's Republic in International Economic Cooperation and Socialist Integration], Bulgarian Academy of Sciences, Sofia, 1979, p 159).
13. The fact that in terms of value an agreement for MSKP between the USSR and the CEMA-member countries is higher by a factor of about three compared with average indicators within the CEMA system is no accident. It confirms the desire of some countries to make use of the advantages offered by the large Soviet potential (market), as a result of which they achieve production concentration and more favorable production and foreign trade results. (Data based on the report submitted by the VNIKI at 21st Economic Conference, Warsaw, October 1980).
14. MEZHDUNARODNAYA ZHIZN', No 9, 1979, p 28.

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CZECHOSLOVAKIA

PROGRESS OF AUTOMATION IN CSSR DISCUSSED

Prague TECHNICKY TYDENNIK in Czech 14 Apr 81 p 7

[Article: "How Automation Is Progressing"]

[Text] The creators of our Czechoslovak JPR 12 program control units in the Tesla Elstroj and Tesla Strasnice enterprises did not anticipate in 1975 what immense scope their undertaking would acquire in a mere 5 years. In cooperation with the first users and on the basis of operating tests, the development work proceeded so far that there arose a special "set of units for automated data acquisition," abbreviated SAPI, and by the end of 1980 various sectors of our national economy had already acquired 570 configurations of this set. It suddenly grew into the most widely used control system in Czechoslovakia because of its modular design, universal applicability and technical parameters. An extremely broad range of control systems can be built up from the components.

Components in the Set

In addition to the JPR 12 basic control units (which are in essence 16-bit mini-computers with an 8 Kbyte memory expandable to 32 Kbyte), the SAPI set includes many other components. All of them were developed by our Tesla enterprises, are in production and are currently sold by the Tesla Eltos sectorial enterprise. They include an interface between the PKL keyboard and the EC 0101 alphanumeric keyboard, an interface between the PDZ teletypewriter and the T 100 teletypewriter, digital inputs and dynamic digital outputs, an interface for the PSS punch-card reader, counters, sensors, JPD data-transmission units, universal interface boards for the DZM 180 printer, JPS interface units for remote measuring and display, and the TRP data-transmission terminal for interfacing with serial I/O equipment at distances up to 20 kilometers.

Interesting Applications

The SAPI equipment has found its way into an extremely wide variety of areas, because its supplier has very purposefully organized programmer training in the Tesla Promes plant in Pardubice and provides the users with detailed, basic, comprehensible handbooks, helps them to create their own application programs, and is even preparing to arrange exchanges of such programs so as to avoid duplication of program development in different organizations. Thus a multitude of interesting applications has been developed in a relatively short time.

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For example, SAPI components are used to control automatic recording of the issuance of motor fuel for all buses and trucks in the CSAD [Czechoslovak Motor Transport] plant in Brno, to control voltage and reactive power in an electric power station at Lipno and to control knitting machines in the textile industry, conveyor transport in the SHR [North Bohemian Lignite Basin] opencut mines, an information system for collecting data from the entire Vltava cascade, psychological testing of persons, and a pattern generator for the production of integrated circuit masks, as well as being used in laboratories and other facilities in health care, the machine building industry, power production, water conservancy, metallurgy and transport. On radio relay paths, the SAPI remotely controls and monitors the operation of unattended stations and the like.

What the Users Say

Interest is immense, almost unforeseeable, so that the production capacity for SAPI equipment is booked up for the next 2 years. Nonetheless, interested persons from other enterprises and organizations who are waiting for delivery of the equipment must not lose time. Engineer Svatopluk Skrivanek, leading specialist of Orgrez Praha (Organization for Rationalization of Power Plants) would be glad to tell all of these requesters that the introduction of the system into our power production industry lasted almost 5 years. First they had to train dozens of workers who acquainted themselves with the technical characteristics and capabilities of the individual components and made thorough preparations in their own organizations; it was only then that, in cooperation with the Tesla Eltos supply and engineering plant, they proceeded to buy the necessary equipment configurations. It is necessary to have one's plan prepared in advance and to have the software ready so that the equipment is not idle for even an hour after its installation--even though it is extremely cheap and simple, costing on the average about a third as much as imported equipment.

In the Opencut Mine

The coal extracted from the Chabarovice Opencut in the North Bohemian Lignite Basin is transported by a long system of conveyor belts and other equipment to the thermal power station in Trmice and the Antonin Zapotocky Fuel Combine. Optimal and error-free control of the entire system centered on the KU 300 wheel excavator requires rapid and precise orientation and communication between the excavator operator, his crew, the managers and the dispatching service. Now, the SAPI system processes all necessary information with such a degree of automation that the mining system can be in operation a full 24 hours a day and its use coefficient in 1980 was fully 96.2 percent.

The set of components monitors the operation of the excavator, the conveyor drive, seven conveyors, an intermediate coal depot, and a group of conveyor belts in the distribution locations and records the causes of breakdowns, summarizes data on tonnage transported, gives hourly, shift and daily reports, monitors extraction by means of sensors, and operates continuously in an environment which contains coal dust and in all kinds of weather. According to one of the designers, engineer Jiri Maly of the Research Institute of Lignite in Mast, the SAPI outputs 295 pieces of information a day on operations, of which more than 95 percent is acquired directly or by processing signals from automatic sensors. The system is independent of human factors and cannot be outwitted.

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In Very High Voltage Distribution Stations

High-quality management of the electrification system requires rapid and precise provision of information to dispatchers at all management levels. Particularly in case of a line breakdown or an outage it is necessary to have instantly available sufficient information for rapid analysis of the cause and development of the malfunction. For all of these purposes, the Czechoslovak SAPI system with its JPR 12 R control computers was selected on account of its reliability and previous successful performance. It is being introduced in 400 kV switching stations and acts as a sequential recorder of malfunctions, a measuring center and a communications device. It makes possible the replacement of similar equipment which had to be imported using foreign exchange. The set of components monitors the operation of protective equipment for very high voltages, and in case of malfunction it outputs a picture of its cause and extent with a 10-millisecond time reading, and also replaces the routine work of crews in monitoring and recording data on electrical values at the switching station, monitors these data, stores them in computer memory and sends them out to the superior dispatcher organization. It must operate just as continuously as the entire electrical system.

In the South Bohemian Nodal Area

Automation of voltage regulation in the nodal areas of our electrical system was previously impossible because the necessary equipment was unavailable. In cooperation with the Research Institute of High Voltage Electrical Engineering in Prague-Bechovice, an SAPI system has been successfully used in the South Bohemian nodal area of Mydlovary-Dasny to control voltage and reactive power between components of the electrical system. This has improved the production and distribution of reactive power and decreased losses in very high voltage lines. The savings realized amount to as much as 50 MW of power at peak demand, which is equivalent to a saving of 7.8 million korunas a year. Other difficult-to-calculate savings are realized by speeding up regulation procedures and making them more accurate, decreasing the requirement for regulator components, and eliminate possible errors and miscalculations by crews in the switching and generator stations. The entire system has been further improved with the help of the producer and supplier of other components in the system.

Controlling the Vltava Cascade

It is well known that the seven lakes and reservoirs in the Vltava cascade can hold as much as 1 billion cubic meters of water and that this immense energy source has an average annual output of 1 million MWh of electrical energy. Controlling this system from Lipno to Stechovice is extremely demanding, because each intervention must be carefully considered in advance. This does not involve simply power production considerations, but also includes navigation, recreation and irrigation concerns. The Vltava serves as a source of drinking and supply water and affects supply rates not only in its own drainage area but particularly on the Laba.

Accordingly, optimizing the operation of the entire system is the aim of integrated management in our power production industry. According to statistical data on the Vltava drainage area for the past 50 years and operating measurements and calculations, an increase of 50,000 MWh of electrical energy in an average water year can be expected from such optimization.

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The first step in modernizing the control and dispatcher system for the Vltava cascade was to provide the dispatcher center in Stechovice with a set of SAPI components. Information on the water levels in the lakes and on the condition of the machinery and its output is sent in the form of telegrams and is received for processing and forwarding to the dispatchers in the form of operating, emergency and other memoranda. At any time they have available a picture of the status of the power stations in the Vltava cascade, including simple balances. All equipment is produced in Czechoslovakia by Tesla, while some components were developed and produced by Orgrez, a special-purpose concern organization in Brno.

The next step will be direct control of power stations by the new SAPI R system. The dispatcher in Stechovice will have the ability to switch individual power stations in and out of the network and to adjust their output.

Other Innovations in the System

The producer, Tesla Strasnice, and the supplier, Tesla Eltos, already have a rich fund of experience with operation of the 570 sets which have been produced. All users generously and willingly share their findings and bring pressure for the development and production of new types of equipment, and for expanding selection and increasing output. The producer is actually meeting these requests. According to engineer Zdenek Krejci, director of the Tesla Eltos supply and engineering plant, series production of the new JPR 12 R program control unit has begun. These exceed by several times the output of the previous JPR 12 units and considerably expand the applications capabilities of the SAPI system. Thus there has arisen the new SAPI R and boards for interfacing with the printers of punched-tape peripherals. Punched-tape readers, tape punches and alphanumeric displays can be connected into the system.

This year the configuration will be expanded with a floppy disk unit which will make it possible to expand the operational capabilities of the entire system. Disk packages, integrated memory, intelligent data terminals and data-collection terminals are being prepared for production. All of this is included in the program for the Seventh Five-Year Plan.

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