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West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 13/81)

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CONTENTS

ENERGY

FRENCH GOVERNMENT ACTS TO PROMOTE USE OF GEOTHERMAL ENERGY

Paris ENERGEIA in French May-Jun 81 pp 4-5

[Article by Edouard Rencker: "The Actions Taken in France"]

[Text] In spite of the technical difficulties to which we have alluded, geothermal energy is already usable. During a speech delivered last 2 April, the minister of industry, Mr Giraud, while reviewing the progress made in this area during the last 10 years, outlined the French geothermal policy. The goal is to triple the number of housing equivalents affected by this energy, that is, to raise if from 1,500 to 4,500 by 1990. The work involved in this area involves two types of geothermal energy, namely, production of electricity and direct use of low level geothermal energy. In the first case, it is planned to employ water and steam attaining temperatures higher than 150°C in order to drive turbines coupled to electric generators. In the case of water at lower temperatures (of the order of 90 to 100°C), conversion of thermal energy to mechanical energy will be achieved by means of thermodynamic machines using secondary fluids. (However it should be noted that this system which is to be developed is still in the experimental stage). The most important use should result from the employment of hot dry rocks by making them artificially permeable. In this manner, the calories of heat would be recovered by passing a fluid, called a transfer fluid, through these rocks. Such studies are being conducted in order to achieve maximum utilization. Attention is directed to those studies carried on in the Massif Central, particularly in the overseas departments (especially at the geothermic power station in Guadeloupe). The second area of geothermic interest is the direct use of low level geothermal energy. This concerns low temperature water (approximately a maximum of 90°C) where the heat is used for a variety of purposes such as heating of buildings, agricultural greenhouses, etc.). At the present time, France ranks first in the world in this type of geothermal energy which should contribute 1 million TEP's to the total available energy. Of course, all of this is expensive, especially since the difficulties encountered in setting up a geothermic project are considerable. The initial investment cost is high. The risk of failure is still great. Lastly, the launching of a project must involve a large number of participants, which is not always easy. Finally, governmental authorities have decided to establish a financial incentive system which has led to appropriation of large funds for geothermal energy. Following is an outline of this financial policy:

Aid for conduction of preliminary studies, not to exceed 50 percent.

A "geological risk: guarantee to protect against failure. This guarantee furnishes a coverage of 80 percent to the prime contractor.

A long-term "mining risk" guarantee.

Aid for the installations in the heat distribution networks by the energy conservation agency. This subsidy could amount to as much as 400 francs per TEP distributed per year.

Aid for construction of greenhouse equipment which could cover up to 30 percent of the non-drilling surface investments.

Aid to regional public establishments, such as 50 percent of the research expenses or 20 percent of the cost of the first drilling.

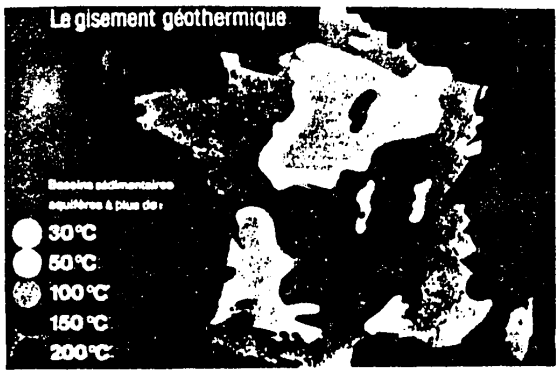
A new legal code favorable to the use of geothermal energy will be initiated.

This policy will be administered with the aid of the geothermal energy committee created in 1974 whose mission is to promote this new form of energy.

We may therefore expect inportant innovations in the field of geothermal energy. Coupled with the substitute fuels program and development of solar energy, the geothermics program and its "colleagues" should increase the contribution of new forms of energy to 25 million TEP's within less than 10 years (at least in France).

On a world scale (see table), the contribution of geothermal energy could be large according to the date calculated at the Istanbul Worldwide Energy Conference. Those countries which have the good luck to be located along the main geothermic belts, such as North or South America, the Pacific Islands, etc., will have the opportunity of satisfying a large part of ther energy needs thanks to geothermal sources.

Le gisement geothermique--Geothermic deposits. Bassins sedimentaires aquiferes a plus de--Sedimentary aquiferous basins with a maximum temperature of:



La France possède des nappes d'eau souterraines dont la température varie de 40° C à 90/100°C. Les principales sont situées dans le bassin parisien. L'Alsace, le Bassin Aquitain, et la Limagne. Le gros avantage de la géothermie en France est que les ressources probables ou estimées sont en général situées sous les lieux de consommation, Paris et la Région Parisienne, Bordeaux etc... Dans les années à venir, les études effectuées en Auvergne pourraient ouvrir la voie vers de nouvelles sources géothermiques utilisables.

France possesses undergound layers of water whose temperature varies from 40°C to 90 or 100°C. The principal ones are located in the Paris, Alsace, Aquitain and Limagne basins. The great advantage of geothermal energy in France is attributable to the fact that the probable or estimated resources are generally located in consumer areas such as Paris and environs, Bordeaux, etc. In the coming years, the research being conducted at Auvergne could open the way to new usable geothermic sources.

1 LES OPERATIONS REALISEES

2 Principales réalisations :

3 Date de mise en service	4 Lieu	5 Equivalents logements	6 TEP remplacées
1970	MELUN	2000	2000
1976	VILLENEUVE-LA-GARENNE	1600	1600
1976	CREIL	1600	1600
1976	BLAGNAC	1000	1000
1977	ST-BRASSERAIN	2000	2000
1978	MELUN	1450	1450
		10650	10650

Réalisations de petite taille 7

1963	MAISON DE RADIO	400	400
1976	LUXEUIL-LES-BAINS	280	280
1977	ST-PAUL-LES-DAX	1200	1200
1978	THOUX-ST-CRICQ	80	80
1978	LODEVE	80	80
		1800	1800
	total (1 à 7)	12800	12800

Chiffres Ministère de l'Industrie 8

OPERATION DONT LE LANCEMENT 9 EST PREVU EN 1981

10 Date de décision	11 Opération	12 Nb équivalents-logements
1979	BOURGOIN (ISERE)	1000
1980	LACCHAMEUVE NORD	1000
1980	ORLY	1000
1980	FONTAINEBLEAU	1000
1980	REIMS-MURIGNY	1500
1980	LAMAZERE	1400
1980	CLERMONT-FERRAND	1000
1981	CLICHY-SOUS-BOIS	1000
1981	MEAUX	1500
1981	ACHERES	1200
1981	EVRY	1000
	TOTAL	12600

Chiffres Ministère de l'Industrie

Key:

1. Existing operations
2. Principal operations
3. Date placed in service
4. Location
5. Housing equivalents
6. Replaced TEP's
7. Small scale operations
8. Figures from Ministry of Industry
9. Operation planned to start in 1981
10. Target date
11. Name of operation
12. Estimated housing equivalents

7619
CSO: 3102/4

INDUSTRIAL TECHNOLOGY

MANUFACTURING MATERIALS IN SPACE UNDER MICROGRAVITY

Paris AIR & COSMOS in French 5 Sep 81 p 46

[Article: "Forthcoming French Space Metallurgy Experiments"]

[Text] The placing of the European space laboratory Spacelab, which is currently scheduled to be launched by the American Space Shuttle in August 1983, at the disposal of a large number of users has made it possible for France to open access to space to a new scientific community, that of material science. Thus was born in 1975 the start of a national effort devoted to the study, experimentation and indeed the exploitation of microgravity in the domain of material science.

Paralleling the efforts spearheaded by the CNES [National Center for Space Studies] Programs Directorate to stimulate this entirely new community of researchers, the Toulouse Space Center undertook in 1976 the design and development of a temperature-gradient oven for the actualization of four of the eight French experiments currently programed for the first Spacelab mission. This oven will also be used for a German experiment.

The CNES management, deeming it necessary to enlarge the basic scientific research effort and to carry out an in-depth experimentation phase, decided toward the end of 1980 to create at Toulouse the GERME [Studies and Research Group on Materials in Space].

Within the framework of the CNES technical effort, this group was assigned two primary missions:

--To provide technical and technological support to French scientific and industrial laboratories for the study, development and exploitation of experimental devices in connection with the manufacturing of materials in space;

--To promote the use of space for material science.

This group, consisting presently of eight persons, constitutes a technical link between the national scientific community and the facilities for experimentation under microgravity.

For the first Spacelab payload, it will carry out the operational takeover of the gradient oven and its calibration for each of the experiments that will use it, and will provide the technical assistance required for the development and acceptance tests of the experimental unit assemblies and participation in two crystal-growing experiments.

For the Franco-Soviet ELMA-02 [Manufacture of Materials (in the Salyut orbital station)], the GERME will prepare the thermal calibration of the Soviet Magma oven and assist the French experimenters (nine experiments being planned) with regard to all interfaces. It is also studying the drawing up of the technical specifications for the transporting of the gradient oven aboard the Salyut station for the Emeraude project, the object of which is to open to French scientists access to space flights of long duration (2 years or more) with availability of an only ground facility.

The GERME is also working together with NASA on a preliminary definitional study of the MEPHISTO [Equipment for the Study of Solidification Phenomena in Earth-bound and Orbital Environments] program being conducted by the Solidification Studies Laboratory of the CNES at Grenoble in scientific cooperation with American laboratories (MIT and NBS).

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TRANSPORTATION

ENGINE MANUFACTURERS DISCUSS JOINT DEVELOPMENT PROJECT

Paris AIR & COSMOS in French 5 Sep 81 p 11

[Text] Pratt & Whitney and Rolls-Royce made public last weekend the fact that they have been engaged in talks over the past several months in an effort to determine whether they can cooperate on the program for producing motors having a thrust of 25,000 pounds (11.3 tons), which are being sought by the builders of airframes for the construction of the new generation of 150-seat airliners: the A 320 (Airbus Industrie), MDF-100 (McDonnell Douglas-Fokker) and 7-7 (Boeing).

These talks have an ambitious objective: The creation of a company that would be assigned combined responsibility for the design and development and then the marketing of the new motors, the world market for which it is estimated will reach 4,000 to 5,000 units between now and the end of the century.

At the last Salon du Bourget, the president of Pratt & Whitney, Mr Carlson, termed suicidal the situation , regarding these projects, that faces the three big motor manufacturers--each of whom will be required to invest some 12 billion francs--and three big builders of airframes, whose financial effort will probably have to be of about a comparable order of magnitude.

Talks were then begun in which CFM [expansion unknown] International (GE [General Electrical Company]-SNECMA [National Corporation for Aircraft Engine Design and Construction]) was invited to offer its views. It appears that CFM no longer plans to throw in its lot with the RJ-500 line of motors and that Rolls-Royce has no intention of joining the CFM motor lineup.

The executives of Pratt & Whitney and those of Rolls-Royce found themselves having to come together again even if only to put the finishing touches on the details of implementation of the Pegasus program, which is linked to the joint Anglo-American AV-8B program. It seems that Mr Carlson found in Lord McFadzean a more understanding interlocutor than Lord Kenneth Keith, who, it has not been forgotten, was at the origin of the divorce between the two motor builders on the defunct JT-10D program, after which the two builders, now having separated, launched competitively the RB 211-535 and PW 2037 motors to snatch the market for motorizing the Boeing 757, an operation the financial outcome of which has been an outright catastrophe.

An Exploratory and Preliminary Stage

The two big motor builders emphasize that their talks have not gone beyond an exploratoy and preliminary stage. Many obstacles will have to be overcome to bring about an effective joint operation. Suffice it to cite the problems raised by the technology transfers while the two big builders are on a collision course with regard to the PW 2037 and RB 211-535 programs. The assignment of tasks will also not be an easy problem to resolve, each of the two builders having his own lineup of partners: Ishikawajima-Harima, Mitsubishi and Kawasaki in the case of Rolls-Royce and MTU [Motor and Turbine Co., Munich?] and Fiat in the case of Pratt & Whitney.
Any eventual agreement must also be submitted for approval by the governments concerned and it is not clear whether the antitrust laws, although they did not play a role in the case of association with MTU and Fiat, might be evoked in the case of an agreement with Rolls-Royce.

The developments in this affair will be followed very closely by French industry, motorization being one of the main aspects of the problems associated with the launching of the A 320 program.

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CSO: 3102/3

TRANSPORTATION

FIAT PURSUES 'VSS' EXPERIMENTAL CAR PROJECT

Theoretical Considerations

Turin LA STAMPA in Italian 8 Oct 81 p 13

[Article by Ferruccio Bernado: "The Meaning of Research on the VSS"]

[Text] Writing in these columns about the VSS (Subsystem Experimental Vehicle) research vehicle in the past few days, for reasons of space we were not able to detail the energy aspects which characterize the vehicle, whose body is made of plastic materials. We all know that any attempt to define the parameters of the car of the future begin with the fundamental precept of lower fuel consumption. This is a road that definitely can be embarked upon so much so that recent models, through retaining their traditional structure, propulsion system and materials, are a great improvement over yesterday's models. Let us not, however, expect miracles, not even in the far off future.

Nevertheless the car of tomorrow may permit significant savings in energy both in the procedures and the materials used to build it. This is demonstrated by the FSS prototype put forth by FIAT. Improvements include: greater production, greater ease, lessened work times (first savings); substitution for the traditional steel outer sheeting of the car with plastic, as well as substitution of iron and aluminum in some components, less steel used in the basic framework thanks to a more rational conceptualization of the framework itself and improved planning techniques, and making use of sophisticated methodologies such as mathematical models. As a result, the vehicle is lighter in every way.

One may object: aren't plastics obtained from petroleum? Isn't what may be saved on one end being wasted on the other? FIAT's technicians answer: "Specialized plastic materials use for the VSS are derived from petroleum byproducts not otherwise usable and not used in the past. Their availability therefore must be considered assured although their cost, at the present state of affairs, is not economically profitable. Furthermore, the energy content of a product in plastic (that is, the energy required to produce it and the energy contained in the material) is about half of that of a similar piece made of sheet metal."

"If one were to consider the cost of the raw materials, the rough casting process and the final finishing process, steel is one and a half times more expensive than plastic and aluminum is seven or eight times more expensive."

Reiterating: the quantity of petroleum needed to produce plastic materials is equal to only 2 per cent of that needed for other necessities: from the production of electricity to that of heating, from the needs of the chemical industry in general to those of transportation. The balance therefore, is strictly in favor of plastics. Caution must be exercised, however. It is not possible to think that from one year to the next, setting aside the matter of investments, that a change as radical as this, involving the whole steel producing industry, may be feasible. Nevertheless, it is the task of research to explore, even if only in feasibility studies, the new ways to safeguard those unrelinquishable human conquests. Individual mobility is one of these.

The meaning of FIAT's work on the Subsystem Experimental Vehicle must also be considered under this view.

Project Manager's Comments

Turin LA STAMPA in Italian 9 Oct 81 p 13

[Article by Michele Fenu: "A Car Such as This Will Last for Twenty Years"]

[Text] "A car such as this can last up to twenty years." That is the opinion of Engineer Paolo Scolari, in charge of FIAT's planning regarding the "VSS" prototype shown recently in Turin. However, longevity in years is but one of the aspects of this very particular automobile, "a car" emphasizes Scolari, "that is real and functional, not a dreamcar devoid of practical applications."

"This prototype" he said, "allows the demonstration of how some goals can be attained such as the simplification and reduction of assembly operations along the assembly line as well as reduction in weight. The body is twenty per cent lighter compared to a similar traditional model. That adds up to an overall savings of about on hundred kilos."

The "VSS" however, is only one of the examples of research undertaken by FIAT. (It cost three years of research in collaboration with various corporations and companies.) "Research" stated Scolari, "represents 2.7 per cent of our budget, which translates into 270-280 billion lire annually. This figure parallels the research budgets of other major world car manufacturers. The research projects already underway are numerous and include those that aim at lower fuel consumption as well as those with other aims."

Scolari made mention of the constant changes industry will be implementing (at least 24 months will be needed) following the positive results of a long series of tests. FIAT is the leader in this interesting field. Mention is made of the volumetric compressor, a type of supercharger already being used in the FIAT 131 and now in demand by many foreign manufacturers. In addition, work is being done on electronic circuitry for engines, direct injection for Diesel engines and, said Scolari, "many other things."

"Things" that are not part of the immediate future, though. Do not think it possible to see a VSS a year or two from now. In theory, a vehicle of this kind will be on the market only by the 1990's. This is due to economical reasons, not

technical ones. Investments of gigantic proportions are necessary, and the whole process used in manufacturing a car must be totally changed. As an example, the gigantic presses in use today would have to be substituted by much smaller machines. Another problem involves stamping plastic in presses. "In order to make a VSS at this time," said Scolari, "another 100,000 lire would have to be added to the cost."

An excercise in futility then? No, because beside the general data acquired by studies of this type, FIAT in the next few years will apply VSS derived technology to some of its newer models. Continued Scolari: "In particular, we plan to use the subsystems involving the front end of the car, the car's rear and above all the rear hatch door, the defroster plate glass window and the dashboard."

In essence, the application of ideas derived from the VSS is a gradual one, as is to be expected from any technical or industrial transformation. Revolutions, from one day to the next are not possible. The important thing is to be prepared, and actually anticipate these changes.

Types of Plastics Used

Turin LA STAMPA in Italian 9 Oct p 13

[Article by Gianni Rogliatti: "Which Plastics Are Used to Substitute Traditional Steel Sheet Metal?"]

[Text] FIAT's Subsystem Experimental Vehicle contains the highest percentage in weight of plastic materials ever used before now: to be precise, it is 26 per cent plastic, compared to Ritmo's 15 per cent plastic, "which is a car that by now has reached full production schedule and contains an elevated percentage of plastic." Contrary to the past, when the term plastic was used generically to mean a material substituted for other more costly materials, today, thanks to the advances of chemistry, materials can be manufactured and set to use that have very specific characteristics tailored to their specific functions.

In order to obtain weight reduction and improved functionality, FIAT's technicians have made use of five different types of plastic materials, the characteristics of which are adapted to each differing task, and which are briefly described below.

Unsaturated Polyester - This is a plastic with high resistance to bending and breaking as well as to high temperatures. It is the material that has the highest specific weight (1.7 grams per cubic centimeter) but still less than steel (7.85 grams) and aluminum (2.7 grams). This material is used for the four doors, the hatch back door and for the external rear side panels.

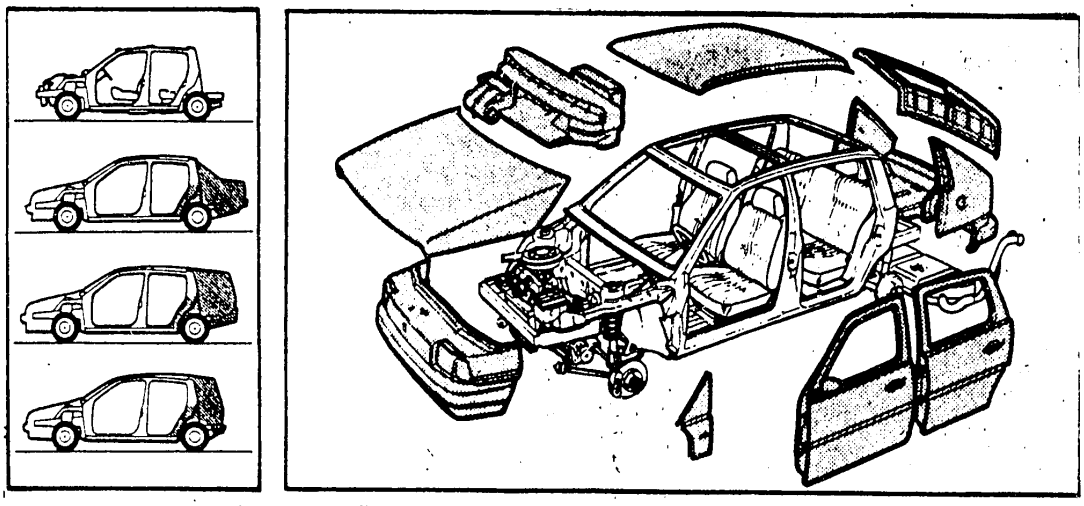
Polyester Foam - As the name implies, this material is derived from the same family of the preceeding material, but features a lighter specific weight and a greater adaptability to insulation and soundproofing given its makeup. Its specific weight is of 0.7 grams per cubic centimeter and it is used in the roof and the engine hood.

Polycarbonate - This is a material of many uses in its varied characteristics (which include even a transparent type). It has a specific weight of 1.2 grams per cubic centimeter and has the highest specific breakage ratio, namely the pressure it can

resist in relation to the weight of the material used. This value is of 50 for polycarbonate but only 38 for aluminum. It makes sense therefore that it be used for both the front and rear bumpers, for the front end of the car, for the trunk floor, the inside panles and for the rear lining.

Modified Polyoxiphenylene - It has median characteristics and as such it is used for the dashboard, whose position requires first of all a pleasant appearance. Its features of resistance to pressures and temperature changes are amply sufficient for this task.

Elevated Molecular Weight Polyethylene - This is one of the better known plastic materials, one that is readily identified simply as plastic due to its use in the manufacture of containers. With regard to the VSS, it is used in the fuel tank due to its not being affected by those chemicals present in gasoline. It has an enormous breakage ration: over 600 per cent versus 100 per cent of the next closest material (Polycarbonate) and versus only 40 per cent for steel. This results in greater security.



Beginning with the main body structure of FIAT's model "VSS," it is possible to make various body styles (left); the metal framework and the uses for the new above-mentioned plastic materials can be noted (right).

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