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SELECTED ECONOMIC TRANSLATIONS ON CZECHOSLOVAKIA

(5th in the series)

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INTRODUCTION

This is a serial publication containing selected translations on all categories of economic subjects and on geography. This report contains translations on subjects listed in the table of contents below.

TABLE OF CONTENTS

CZECHOSLOVAKIA

Past and Future of Petroleum Chemistry in Czechoslovakia

[This is a translation of an article by Vladimir Vicha in Chemicky Prumyslu, Vol X, No 2, February 1960, Prague, pages 57-59; CSO: 3907-N]

The development of organic chemistry depended until recently directly or indirectly on coal. High and low thermal tars, benzene and its homologues, later coke and coking gas and coal proper have been the basic raw materials used by organic chemistry. The principal raw materials have therefore been products connected with the progress made in the production of iron (coking) and of smokeless fuel (carbonization). These raw materials will continue to be important but will be supplemented by new laboratory-developed chemical products.

Crude oil, originally used exclusively for the manufacture of engine fuel and for power supply requirements, became, together with natural gas, important new raw materials for organic chemistry. The development of organic chemistry, and of certain products in particular, would be unconceivable without them.

The recent process of crude oil into engine fuel by modern production methods for high octane motor-vehicle gasolines offered a new raw material source: the hydrocarbon gases. The branch of chemistry built on this raw material, consisting of crude oil and natrual gas, is called petroleum chemistry.

The raw materials of petroleum chemistry have considerably increased the industrial variety of chemical products. For technological and economic reasons, an industrial output of many new products would not be possible with methods used by coal chemistry.

Coal chemistry has become neither second to nor has it been replaced by petroleum chemistry. Both categories of basic organic chemistry supplement each other.

The Situation and Development of Petroleum Chemistry in the World

The industrial expansion of petroleum chemistry started in advanced industrial countries in conjunction with the manufacture of engine fuel, particularly high octane gasoline, and with the discovery of adequate natural gas supplies. The intense production of hydrocarbon gases offered the much needed basis for organic chemistry and was instrumental in its sharp rise. Figure 1 indicates the world production growth of petroleum chemistry and of chemical production in general. While the figures fiven in the graph are approximate and informative, they indicate that the growth occurred specifically in raw material for petroeum chemistry. Anorganic chemistry participates in about one half of the entire world production.

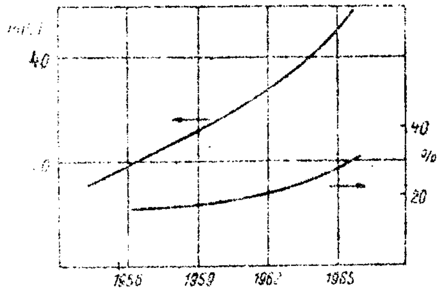

Figure 1

Development of World Petroleum-Chemical Products in Tons per Annum and Their Percentual Ratio to the Entire Chemical Production

European countries registered a sharp rise in petroleum chemistry during recent years by utilizing gases from refineries, natural gas, and gasoline.

The development of petroleum chemistry depends on the raw material basis available in the respective countries. Countries short on natural gas and hydrocarbon gases from refineries are using crude oil distillates, principally gasoline, as the raw material basis for petroleum chemistry. This is the practice in most European countries.

Petroleum chemistry is the sole basis today for the production of many chemical articles--e.g., ammoniac, methanol, ethanol, higher alcohols, glycols, ketones, phenols, glycerin, benzine homologues, etc.

Basic Petroleum Chemistry Technologies

The development of basic petroleum chemistry technologies has not yet been completed, even in its fundamental outlines. New and more economic technologies are constantly being developed and applied in production. Some of the new technologies are:

a) pyrolysis of gaseous and liquid hydrocarbons (gasoline) in the manufacture of gaseous olefins;
b) separation of methane (natural gas) by means of gas or oxygen to obtain synthesized gases for the manufacture of ammoniac and methanol and possibly for the simultaneous manufacture of acetylene;
c) high thermal pyrolysis of liquid gasoline hydrocarbons for the manufacture of synthesized gas, acetylene, and ethylene;
d) various direct chloride, oxide, and other reactions of gaseous and liquid hydrocarbons;
e) the manufacture of aromatic hydrocarbons from crude oil fractions, predominantly from gasoline fractions.

The creation of an adequate amount of additional raw materials, principally gaseous olefins, offered the basis for the development of new technologies, among them the technology of direct hydration of ethylene into ethanol, direct oxidation of ethylene into ethylenoxide, the manufacture of phenol and acetone, etc.

The manufacture of acetylene by new petroleum chemistry methods gradually eliminate the costlier carbide technology. The typical products of petroleum chemistry are the olefin hydrocarbons. Their manufacture is based on the pyrolysis of gaseous and liquid hydrocarbons. A widely used technology is the pyrolysis in the tube furnacess under 700 to 800 degrees centigrade temperatures, with variable additions of water vapor. There is also a fluid technological method appropriate for heavier raw material known the world over; however, because some of its technological elements are rather demanding, this method has not become very popular. The development of pyrolysis coincided with the development of physical and physical-chemical separating methods for the separation of pyrolytic gases. Today the separation is made either by absorption under pressure or by the low-thermal or even the condensation method. The technology selected depends on the purity specification for the olefins to be produced.

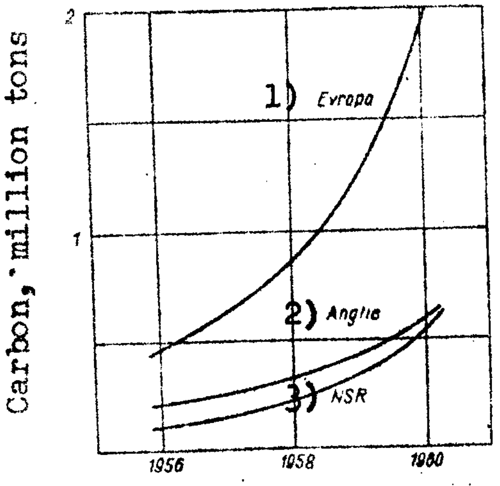

Figure 2

Development of Petroleum
Chemistry Production
in Europe
(in Tones of Carbon)

1) Europe
2) England
3) West Germany

Other methods of separation by extraction have been developed to separate butane-butylene and butylene-butadiene mixtures. There are also the catalytic methods of dehydrogeating hydrocarbons.

The purity specifications of some processing methods are of the highest standards; the manufacture of ethylene can attain a purity of 99.8 percent, propylene 98, and acetylene 99.8 percent. These rather high standards complicate the structure of the separating plants and require huge manufacturing units in order to make the production economical. This is a characteristic of the petroleum chemistry methods.

Future Needs of Basic Raw Materials for Organic Chemistry in Czechoslovakia

The existing organic chemistry industry has been based exclusively on coal chemistry. The call for new types of products in conjunction with the present growth of currently made products makes the expansion of our raw material foundations to include crude oil and natural gas imperative.

The radical development of processed crude oil and the peculiar structure of engine fuels in Czechoslovakia made low octane gasoline into a new raw material basis. The pyrolysis of low octane gasoline in conjunction with hydrocarbon gases from refineries will cover the requirements for

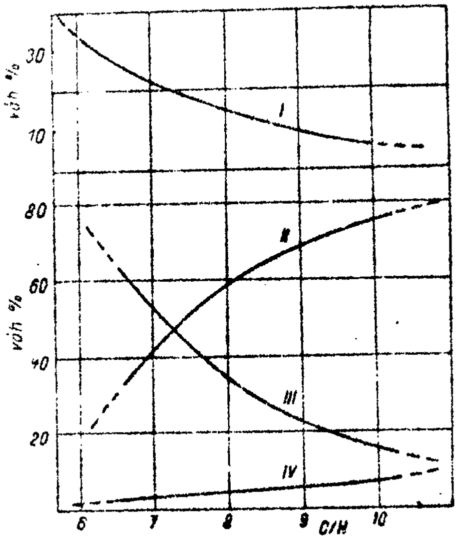

Figure 3

Dependence of Products Gained from Pyrolysis of Hydrocarbons at 800 Degrees Centigrade on the Ratio of Carbon to Hydrogen C/H

I--Ethylene
II--Pyrolytic Oil
III--Pyrolytic Gas
IV--Coke

The selection of basic organic raw materials for the Third Five-Year Plan was guided by the following principles:

a) optimum utilization of crude coking benzol, brown coal, and high thermal tars for the production of aromatic polycyclic hydrocarbons and phenols;
b) utilization of crude oil gasoline for the production of gaseous olefins;
c) utilization of natural gas for the production of synthesis gas and acetylene. We shall also continue to use present technologies, involving, for example, carbide acetylene.

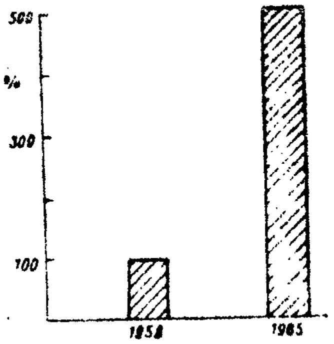

Figure 4

The Rising Demand for Basic Organic Raw Materials (Aromatic Hydrocarbons, Phenols, Olefins, etc.)

For the production of gaseous olefins we have selected crude oil, mainly because of its high hydrogen content; it has been secured by an agreement for supplies of sulphuric paraffin crude oil from the USSR. The ratio between hydrogen and carbon clearly determines that this raw material is suitable for the production of ethylene and higher olefins (see Figure 3). Low octane gasoline with the ratio of C/H 6.1 yields 25 to 30 percent ethylene; black oil from paraffin crude oil with a ratio of C/H 7.3 yields only approximately 20 percent, and brown coal light tar with a ratio of C/H 8.7 not more than 10 to 15 percent. A higher C/H ratio lowers the hiled of ethylene and also the volume of ethylene in the pyrolytic gas; the cost of separating pure olefins is accordingly higher. This leads to the conclusion that for our purpose crude oil gasoline is the most suitable material for petroleum chemistry.

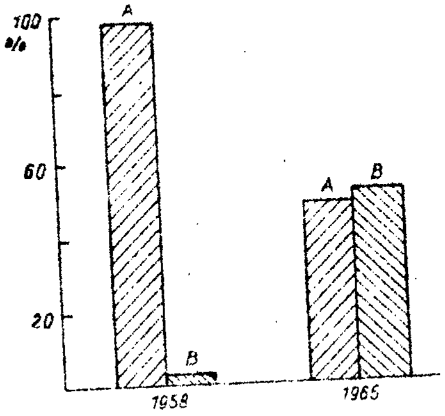

Figure 5

Proportions of Coal and Petroleum Chemistry Raw Materials

A) Carbon
B) Petroleum Chemistry Raw Material

During the Third Five-Year Plan we shall build large pyrolizing plants for hydrocarbon gases and gasoline with a lineal 3- to 10-ton per hour capacity; they will be linked to separating units with capacities in excess of 200,000 tons per year. When the new plants are ready, we shall have the raw material foundations for synthetic rubber, plastics, chemical fibers, and synthetic laundry products. On the basis of petroleum chemical raw materials, we have scheduled the production of ethylene to exceed 100,000 tons per annum, and propylene over 50,000 tons per annum, in addition to butylenes, butadiene, and acetylene. We follow the basic construction pattern for large capacity units designed for mechanization and automation and promising great economy of production.

The raw material basis of organic chemistry will shift to petroleum chemistry. Figures 4 and 5 reveal that the growing organic chemistry production will be supplied predominantly with raw materials for petroleum chemistry.

Conclusion

The directives of the Eleventh Czechoslovak Communist Party Conference and the government for the Third Five-Year Plan charge the chemical industry with important tasks. They will be fulfilled with the help of modern and highly efficient investments. Petroleum chemistry is one important branch of chemistry that will make its contribution to the realization of our tasks. To ensure that these sometimes very difficult and demanding tasks will meet with success, we must make them the concern of every chemist, worker, planner, and constructor engaged in the project. We shall reach our goals through cooperation in research, production, and planning as well as through cooperation with all people's democracies headed by the USSR.

The introduction of modern technologies requires qualified technicians and workers in order to ensure both construction and maintenance. The successful fulfillment of the Third Five-Year Plan will create the basis for the development of the chemical industry in the Fourth Five-Year Plan.

CZECHOSLOVAKIA

Economic Briefs

While Czechoslovakia is a large consumer of rubber, her rubber production is among the lowest in the world. Our rubber industry depends entirely on imports. With the gradual development of the national economy, the rubber imports will become even more necessary. Our rubber imports in 1957 were 170 percent higher than in 1950, and they are expected to reach 220 percent by 1960. The development of our rubber industry is hindered by fluctuating prices and political trends in the world which are reflected in rubber shipments and prices. The Party and government have therefore resolved to build a domestic synthetic rubber manufacturing plant that will ensure the further development of our rubber industry.

(_Chemicky Prumysl_, Vol X, No 2, February 1960, Prague, page 98; CSO: 3907-N)

* * *

The problems of securing the raw material for and ensuring economy in the production of synthetic rubber in our country have been time and again carefully analyzed in order to select prime materials and ensure their supply. It has been determined that our conditions are favorable for the introduction of rubber production and that there is no actual difference in whether this production is based on alcohol or butane. Economic research led to the preparation of a synthetic rubber plant project for the manufacture of SKS-30A type butadiene-styrene rubber. The plant will be built in several stages. First we shall produce butadiene from synthetic alcohol and later on the basis of C_4-hydrocarbon (n-butene and n-butane).

Changes in the selection of prime materials caused considerable delays in the schedules, beginning with the declaration of directives ensuring our rubber production and culminating in the start of construction. The supplements to and changes in the project have brought some gains. The chemical project (chemoprojekt) enriched the program with new elements and new solutions. The upshot is the reduction of the originally planned cost from 39,300 koruny per ton of production capacity to 22,000 koruny per ton, and the substantially lower production costs.

The National Research Institute for Synthetic Rubber in Gottwaldow (Vyzkumny ustav syntetickeho kaucuku n.p.) has been charged with the preparation of the production of basic synthetic rubber types. In its research work the institute tested technological production problems, with results that will be applied to actual factory production; it developed its own types of catalyzers and recommended a series of technological improvements for the first stage of the project, among them a new polymerization measure including the preparation of rubber in powder.

We refer also to research work done by other institutes, particularly the Research Institute for Crude Oil and Hydrocarbon Gases at Bratislava (VU pro ropu a uhlovodikove plyny). A new type of selective calcium-nickel-phosphate catalyzer to dehydrogenize butene and butadiene were developed there. The catalyzer gives a 30-percent conversion on butadiene at a 90 percent selectivity; it will be used in the second construction stage of the rubber enterprise at Kralupy.

The first construction stage was started in August 1958 and is scheduled for completion in 1963. It will be followed by the construction of another plant scheduled for completion in 1965. We have embarked on a project for the production of chloroprene rubber. The process will be based on acetylene gained by partial oxidation of methane.

The realization of the contemplated synthetic rubber production will place Czechoslovakia among the leading countries of the world in both consumption and production.

(Chemicky Prumysl, Vol X, No 2, February 1960, Prague, page 99; CSO: 3907-N)

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The design department of the TOS [presumably Machine Tool Factories] developed a series of types of drilling units of various sizes with hydraulic feeds. They are manufactured in the TOS plant in Lipnik.

Technical Data--JVH 10

Maximum capacity in drilling 11,600-diameter material	10 millimeters
Operational lift of the arbor	250 millimeters
Motor output	1 kilowatt
Weight of the unit	130 kilograms
Speed of feed	about 6 meters per minute

Technical Data

	JVH 32	JVH 40	JVH 63
Total lift of the unit in millimeters	350	450	450
Range of the operational feed	20 to 250 millimeters per minute		
Axial pressure (kilograms)	1,100	1,800	3,500
Speed of feed	about 4.5 meters per minute		
Motor output (kilowatts)	3	5.5	11
Revolutions per minute	140 to 1,800	140 to 900	

Technical Data--JVH 25

Operational lift of arbor	200 millimeters
Range of the feed	20 to 250 millimeters per minute
Range of speed of feed	2.5 meters per minute
Output of electromotor	2 kilowatts
Revolutions per minute of the arbor	110, 140, 180, 280, 255, 450, 560, 710, 900, 1,100, 1,400

(*Strojirenska vyroba*, No 2, Februaru 1960, Prague, pages 62-64; CSO: 3830-N/b)

* * *

One of the exhibits at the First International Fair (1. mezinarodni veletrh) in Brno was the semiautomatic SP 25 copying lathe with program regulation manufactured by the Kovosvit National Enterprise in Sezimovo Usti. This semiautomat is designed mainly for working shaft parts up to 180 millimeters in diameter and 630 millimeters in length.

Some enterprises will receive these very efficient machines very soon, and therefore we shall explain, with several example, their advantages, the method of perparing the technological program, and the setting of the operational cycle.

A detailed description of the machine was offered in Strojirenska vyroba No 11, 1959, and we therefore give only the most important data:

Output of the motor	19 kilowatts
Maximum running diameter (obezny prumer)	250 millimeters
Maximum length of turning	630 millimeters
Revolutions per minute	112 to 2,540
Number of automatically changed revolution speeds during the run	3
Range of the feed	0.01 to 5 millimeters per revolution
Number of automatic feed changes during the run	3

(Strojirenska vyroba, No 2, February 1960, Prague, page 65; CSO: 3830-N/b)

2076

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It is not necessary to deal with the present state and results achieved through the automatic regulation of open-hearth furnaces. There are a number of studies in our technical literature devoted to the regulation of the individual circuits as well as the complex schemes of the regulation of the thermal regime. At the present time, Czechoslovakia is applying programmed automatic regulation with mechanical coupling, according to Engr Kostal (NHKG [Nova hut Klementa Gottwalda; Klement Gottwald New Metallurgical Plant]), TZ VRSR [not identified], first introduced in KMK [not identified] in the USSR; automatic regulation of the furnace heat in dependence on the temperature of the crown according to the

British firm, Kent (VZKG) [Vitkovicke zelezarny Klementa Gottwalda; Klement Gottwald Iron Works in Vitkovice], and triple-ratio combustion regulation of the "Askania" type (ZBC) [not identified].

(Hutnicke listy, No 2, February 1960, Prague, page 85; CSO: 3830-N/b)

* * *

The shortcomings of the hydraulic program regulation with mechanical coupling, as mentioned previously, led in Czechoslovakia to a revision of the whole system and to a proposal of program regulation which would include circuits regulating the temperature of the crown and grills of the air regenerator. The adjustment was made in horsepower. This type of regulation also permits control of the carburetor agent, of the setting of temperature diffcerences in the air regenerators in the circuit of the automatic reverse, or even the pressure in the operational room of the furnace. The adjustment also includes the automatic regulation of the temperature of the gas and air chambers.

The Industrial Automation Works (ZPA [Zavody prumyslove automatisace]) in Prague designed a scheme for electric automatic regulation of the thermal regime for the SM [Siemens Martin; open-hearth] furnaces of the old VZKG steel mill, which are gradually being converted to oil heating. The project, which will be put into effect during 1960, is based on the actual conditions of the ZPA; it represents the first independent design in Czechoslovakia. The system solves the automatic regulation of combustion by means of a three-bridge system of regulators wiŧh mutual coupling.

(Hutnicke listy, No 2, February 1960, Prague, page 86; CSO: 3830-N/b)

* * *

Iron powder is manufactured in Czechoslovak plants by the following methods:

a) Mechanical method ("Hametag" method)
b) Puverization by a rotating wheel, the so-called granulation powder (DPG) [a German abbreviation]
c) "Spongy iron" (zelezna huba) is manufactured from iron scale in small volumes
d) The production of "spongy iron" in 1961 is planned on a larger scale instead of using the mechanical method; the present DPG method will be replaced by pulverization by means of a rotating wheel under pressure (RZ) [German abbreviation].

Mechanical powder is formed by grinding pieces of iron wire of a specific chemical composition in specially adjusted turbulence mills with a protective atmosphere. The pieces of iron wire are set in motion by rotating arms of the mill and are ground to the desired grain size by being knocked against each other. The iron powder has a laminated form.

Granulated powder is formed in granulation installations where molten superheated cast iron is pressed through a granulation nozzle by a powerful water jet and fast rotating blades. The formed grains are round and have a strongly oxidated surface.

Besides that, powder metallurgy requires double-acting presses--i.e., presses with equal pressure from above and below--whose design has been only partially solved in Czechoslovakia.

(Strojirenska vyroba, No 2, February 1960, Prague, [illegible] pages 82-83; CSO: 3830-N/b)

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Contacts

A speciality developed in Czechoslovakia in recent years is contacts for electrical machinery and apparatuses manufactured by the powder-metallurgy method in almost all qualities known on international markets. Particularly well developed types, as far as technology and quality are concerned, are those corresponding to the "Metallwerke Plansee Elmet-rotung" and "Elmet-silvung" brands. We have also succedded lately in replacing the spot wllder of the Belgium Elkonite brand. All these types are manufactured under the ASKO label;

the manufacturing technology was developed in the Research Institute of Powder Metallurgy (Vyzkumny ustav praskove metalurgie) in Priper near Decin. The following types are manufactured as substitutes for the Elmet-rotung brand:

ASKO A-76 and A-76/a	For the highest voltage and the highest currents (expansion switches [circuit breakers]; also used as sparking contacts in contactors)
ASKO A-67	Resist the arc; for high-tension loads
ASKO A-60	For difficult conditions and 220 and 380 voltage; can operated without sparking contacts
ASKO A-40	For 220 and 380 voltage, and high tension. Suitable for switches and air contactors. Have medium transient resistance

Substitutes for Elmet-silvung:

ASKO F-50	For 60 and 220 volt switches for 220 voltage
ASKO F-30	For low voltage and high tensions up to 60 volts. Have very low transient resistance
ASKO 0-15	For the lowest voltage and rather high tensions. They can be easily wired.
ASKO 0-25	For universal use from 24 to 220 volts. They are rather resistant to sparking, have low transient resistance. They are used in switches with sparking contacts.

Other Types Based on Silver:

Silver-graphite (AgC-2, AgC-5)	Sliding contacts and very low transient resistance. When the carbon content is high they resist welding completely, even under the highest short-circuit currents
Silver-iron (AgFe-15 and AgFe-25)	For vibrators and 24 and 6 ampere breakers

Silver-cadmium oxide	For special cases of breaking low current (up to 30 volts) and higher tension under difficult conditions

(<u>Storjirenska vyroba</u>, No 2, February 1960, Prague, pages 85 and 86; CSO: 3830-N/b)

- END -