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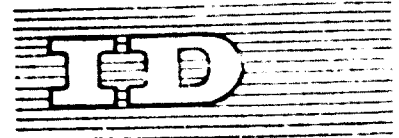
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DEVELOPMENT OF THE PETROCHEMICAL INDUSTRY

IN ROMANIA<sup>1/</sup>

by

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<sup>1/</sup> The views and opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Secretariat of UNIDO. This document has been reproduced without formal editing.

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Romania was among the first European countries to use natural hydrocarbons as raw materials for the chemical industry. As early as 1934-1936, an installation for the production of ammonia from methane was opened at the Tîrnăveni Nitrogen plant, and an installation for carbon black production began to operate at the Sonestan Company's factory at Copsa Mică. At the latter factory, formaldehyde was produced by the direct oxidation of methane for the first time in the world.

Extensive research work was also undertaken for the profitable utilization of petroleum by-products in the chemical industry. The Edeleanu process for the extraction of aromatic compounds from petroleum hydrocarbons using liquid sulphur dioxide is still employed on an industrial scale in many countries.

Although economic surveys published in 1946 showed a high degree of economic efficiency in the chemical processing of petroleum gas, an industry founded on this source of raw material could be created only after the Romanian People's Republic had adopted a planned economy.

Bearing in mind the importance of the chemical industry for the development of other branches of the national economy, the Government has devoted special attention to the all-round development of that branch of industry. Efforts have been directed towards building up a powerful petrochemical industry guaranteeing high-level utilization of the country's natural resources. Many factories and schemes equipped to employ world techniques are now in operation, while others are in an advanced stage of construction. The rapid rate of development of this industrial sector has been favoured by the existence of rich sources of natural raw materials. In 1966, methane production amounted to more than 15,000 million cubic metres. During the same period, petroleum production increased from approximately 6.6 million tons to over 12.7 million tons. The production of natural gas has also substantially increased.

Owing to the availability of two sources of raw materials - methane gas and petroleum products - the petrochemical industry in the R.P.R. is developing chiefly along two lines.

Some of the petrochemical plants use methane as a raw material, while others are based on petroleum product raw materials.

Methane is used as the raw material for all the ammonia produced in the R.P.R., 95 per cent of which is employed in the manufacture of nitrogen fertilizers.

Until 1970, nitrogen fertilizer production will increase, and the production of other types of fertilizers will similarly grow, so that the country's fertilizer industry can supply the amounts of nutritive substances needed. According to forecasts, fertilizer production will steadily increase in 1970 - 1975, reaching a level of 2.2 - 2.4 billion tonnes (100 per cent) in 1975.

A wide range of basic organic chemicals are derived from methane by way of acetylene.

An acetylene plant with an annual capacity of 20,000 tonnes which supplies the raw material for vinyl chloride and trichloroethylene production is now operating at the Borzesti chemical combine.

Other acetylene plants are operating, at Săvinești, the Craiova chemical combine and the Râșnov chemical plant.

Of the above, the installations at the Râșnov chemical plant and the Borzesti chemical combine use the electric-arc methane cracking method developed by research institutes in the R.P.R.

Among the products obtained from methane gas by way of acetylene, mention should be made of the production of acetic acid, butanol, acetate and polyvinyl acetate carried out by the above-mentioned combines.

Methane is also used in Romania by Carbochim Sepsa Sica for the synthesis of hydrocyanic acid intended for the production of methacrylate resins and for use by the Săvinești synthetic park and fibre factory, where acetylene is also consumed for the manufacture of acrylonitrile.

Several of our petrochemical factories use petroleum raw materials such as petroleum gas, liquid petroleum products - in particular naphtha and solid products such as paraffin.

Petroleum gases, particularly the propane-, propylene fraction, are used in the production of isopropylbenzene, the intermediate product for phenol, acetone and synthetic rubber.

The synthetic rubber and petrochemical product combine in Sărbăntoara-Dolj is one of the largest petrochemical plants in which the production of phenol and acetone has been combined with the production of synthetic rubber.

Some of the isopropylbenzene produced by the combine is transformed into phenol and acetone by the cumene process in a plant with an annual capacity of 22,500 tonnes of phenol and 14,000 tonnes of acetone.

Another part of the isopropylbenzene produced by the combine is used in the production of methyl-styrene, the co-monomer needed in the production of synthetic butadiene-styrene rubber. The combine uses n-butane and a mixture of butane and butylene as raw materials in the production of butadiene.

In order to meet phenol requirements, the petrochemical combine at Floesti has commissioned a new phenol/acetone installation with an annual capacity of 25,000 tonnes of phenol and 15,000 tonnes of acetone.

For the processing of petroleum gas into basic organic chemicals, the first gas pyrolysis and fractioning unit has been installed at Floesti and is now producing ethylene and high-purity propylene, which are further processed by the same combine and transformed into polyethylene, ethylene oxide, glycol and phenol.

The manufacture of macromolecular products has been directed towards the production of plastics, synthetic rubber and synthetic fibres.

The production of vinyl chloride on a petrochemical base is concentrated in the Borzesti chemical combine and the new Râmnicu-Vâlcea combine, which also produces electrolytic chlorine for the synthesis of vinyl chloride.

Among the most important thermoplastics manufactured in the R.D.R. are the polyethylene produced by the petrochemical combines at Floesti and Pitesti and the polystyrene produced by the synthetic rubber and petrochemical combine at Gheorgheni.

The plastics factory of the Craiova combine for the chemical processing of methane produces polyvinyl acetate, which is used in the manufacture of water-emulsifiable types, polyvinyl alcohol and acetals.

Increasing the production and widening the range of plastics is one of the major concerns of Romania's petrochemical industry.

The production of carbon black, which is closely linked to synthetic rubber production, has also been steadily developing. A new carbon black factory has been opened at Pitesti for the production of a variety of types of high-abrasion carbon black.

Liquid petroleum products are today the basic raw material for ethylene plants. The pyrolysis plant operating in the Pitesti petrochemical combine, which has a yearly production capacity of 100,000 tonnes of ethylene, uses heavy fractions.

The development plan calls for the establishment of a new naphtha pyrolysis

plant to produce the ethylene needed to increase production of polyethylene, polyvinyl chloride, ethylene oxide and glycols and to provide for the expanded ethyl alcohol production capacities. The propylene obtained in this plant will be processed into acrylonitrile, polypropylene, alcohol and rubber.

Solid petroleum products are now being processed by a Romanian process for paraffin oxidation using gamma radiation.

The SIB factory at Bucharest produces synthetic fatty acids by paraffin oxidation. The acids are further processed and transformed into fatty alcohols in a plant at the Borzesti chemical combine.

With regard to weed-killers, a plant for the production of 2,4-dichlorophenoxyacetic acid by a technological process developed in the U.S.R. has started operating at the Borzesti chemical combine.

The manufacturing technologies used in our industry are of various origins.

In selecting them, primary consideration has been given to the level of world technology and maximum economic efficiency.

In fertilizer production, large-capacity production has been adopted for ammonia (200,000 to 300,000 tonnes); in the pyrolysis plants, annual capacities of at least 100,000 tonnes of ethylene have been retained, while with regard to vinyl chloride production, the ethylene oxychlorination process has been selected in place of the process based on acetylene and hydrochloric acid.

Acrylonitrile has been synthesized in a new plant operating on the basis of propylene rather than the acetylene and hydrocyanic acid used by the old plant at the Săvinești complex.

Romania's petrochemical industry has been able to develop so rapidly owing to a series of interrelated measures applied in all fields of the national economy.

The co-ordination of capital works with the development requirements of the petrochemical industry has been one of the major measures guaranteeing the industry's constant development in the U.S.R.

In order to expand the raw material base for the petrochemical industry in the petroleum sector, a catalytic reforming plant with an annual capacity of 1 million tonnes of feedstock has been opened, in conjunction with a plant for the extraction and separation of aromatic compounds and a similar plant with an annual capacity of 500,000 tonnes of feedstock, which yield in all 100,000 tonnes

a year of aromatic compounds and 120,000 tonnes of gas and light fluid fractions for chemical processing. The petroleum gas requirement for the petrochemical industry is met by two gas absorption and separation plants with a total annual capacity of 350,000 tonnes.

From the very first years under a planned economy, preparatory steps were taken to ensure the unhampered development of the petrochemical industry. Extensive research was undertaken on the chemical utilization of petroleum raw materials and methane. This research was begun in 1948 in the ICHIT and ICECHIM research institutes at Bucharest, and in following years, two other research institutes were established, i.e. the ICHOCOM institute at Ploesti intended to carry out studies regarding the chemical utilization of petroleum products and the CHIMAZ institute at Medias, which performs research regarding the chemical utilization of methane.

A number of semi-industrial installations operate within these research institutes, ensuring close co-operation between research and chemical engineering work. The combines are also equipped with modern research laboratories whose principal objective is the improvement of manufacturing technology and product quality as well as the utilization of by-products resulting from the manufacturing process.

The basic research institutes in this field make an important contribution to the development of the petrochemical industry.

In order to provide current information on world technical standards, the petrochemical industry has at its disposal an extensive network of documentation offices. Plans for petrochemical plants have been prepared by the ICECHIM Institute at Bucharest and the ICH Institute at Ploesti. In the light of current technology, the designing teams in these institutes, grouped according to specialization, are solving technological, equipment and construction problems, as well as problems related to automation and the supply of utilities to the newly constructed plants.

In view of the steady development of the chemical industries, IPRAN, a new design institute specializing in studies concerning inorganic chemical plants and fertilizer and ammonia plants, was commissioned in 1963. A number of designs are being prepared by petrochemical plants themselves, which are staffed with personnel qualified for this work.



The engineers and technicians engaged in designing and plant operation have benefited from exchanges of experience and from information on similar plants abroad arranged on the basis of inter-governmental agreements or special contracts.

Several modern plants in petrochemical factories already operating, or under construction were designed in the R.F.R. and set up by Romanian mechanical engineering undertakings. Large-capacity mechanical engineering undertakings have been reorganized and specialized in the production of equipment for the chemical industry.

The Romanian mechanical engineering industry is now able to meet a large proportion of the petrochemical industry's equipment requirements with machinery and equipment whose technical performance is commensurate with world technical standards.

The experience hitherto gained in the construction and operation of petrochemical plants has laid the groundwork for the further development of that industrial branch.

The above account makes clear the exceptional importance of the petrochemical industry for Romania's economic development.

The petrochemical industry of the R.F.R. has in a short time become the activating factor in material production and in raising the technical level in all branches of the national economy, thus greatly helping to raise the living standard of the country's population.





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