

Haferkamp, Wilhelm

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# Pipeline Network for Europe

by Wilhelm Haferkamp, Brussels \*

**As Western Europe's demand for mineral oil is steadily rising and has induced a vast refinery industry, growing volumes of both crude oil and finished petroleum products have to be carried by transport. In response to that development, more and more pipelines have been and are still being built. They are growing into an integrated network of piped transport of petroleum liquids and gases, whose rate of expansion is remarkable.**

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Western Europe lacks sufficient indigenous crude reserves and up to the World War II the area was almost completely dependent upon imported petroleum products. Demand was then still comparatively modest, so that existing carriers were easily able to absorb the respective transport volume. This state of affairs continued for some years after the war, but from about 1950 onwards, oil requirements started to grow by leaps and bounds, enforcing the reorientation of oil supplies.

## Causes of the Change

In line with the growth of demand, almost all the European countries began to build their own industries of crude processing. Within a short period, the number and overall capacity of West European refineries multiplied, because West Europe shifted the structure of its supplies from the import of finished products to that of crude, which its own refineries are now treating and processing.

With very few exceptions, these new refineries were built on or very near the European coastline. To supply them with crude through existing ports usually did not prove very difficult, because ocean tankers were, in most cases, able to berth alongside the refineries' own quaysides or oil terminal jetties. Those few refineries which were situated inland had been built either in the neighbourhood of local oilfields or on the banks of navigable rivers and canals, and only in a few cases they had to be linked to neighbouring ocean or river terminals by short spurs of pipe.

It was only in early 'sixties that a construction boom for inland refineries near the big inland consumer markets began to necessitate the laying of extensive trunk oil pipelines. Many new refinery centres were set up in the focal industrial complexes that are situated far from the sea, caused by rising oil consumption in Western Europe, whose overall demand grew from 64 mn metrical tons in 1950 to 200 mn tons in 1960 and 600 mn tons in 1970.

The new refineries which serve inland markets have to be supplied continuously with enormous quantities of crude over longer distances. These three requirements: continuous supply, big volumes, and long transport distances, are the specific foundations for the economic operation of trunk pipelines, many of which were now built in quick succession to link European ocean terminals for crude at Rotterdam, Marseilles, Genoa, Trieste, Le Havre, and Wilhelmshaven with the newly emerging inland centres of refining.

## Trunk Lines for Crude

The first of the big European crude trunk lines was completed in 1953 in Germany: the *North-West Oil Pipeline* (NWO) is linking Wilhelmshaven with refineries in the Cologne area. A short time later *Rotterdam-Rijn Pijpleiding* (RRP) went into operation. This also leads from the coast of the North Sea to the vast Ruhr-Rhine industrial complex, which is situated far inland.

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\* Vice-President of the European Communities.

In 1963, *Pipeline Sud-Européen* (PLSE) came into use, starting from the Mediterranean terminal of Lavéra near Marseilles and pumping crude to French and German refineries. Later on, two further pipeline links were built from the shores of the Mediterranean to the continental heartland of Europe. Of those, *Central European Line* (CEL) takes its origin in the Mediterranean port of Genoa and ends at Ingolstadt, where many Bavarian refineries have arisen. Later, also *Trans-Alpine Line* (TAL) was run from the Adriatic harbour of Trieste to Ingolstadt. TAL has its own link with PLSE through *Rhein-Donau-Ölleitung* (RDO).

To these big arteries of crude supply, which run from North to South and vice versa, another one has recently been added, which comes from the West at Le Havre on the Atlantic coast and runs due east. Finally, it has to be added that a number of other trunk line projects are already building or are being in an advanced stage of planning. This will make the European network of crude pipe lines, whose overall length, today, amounts to about 7,000 km, even more closely integrated.

#### Trunk Lines for Products

Recently, trunk lines for finished products have been gaining in importance in Western Europe. As in the case of crude trunk lines, a further expansion of demand had to come before products lines between refineries and regional or local centres of consumption became economically feasible through a sufficient transport demand. There are already three important products trunk lines which operate in the United Kingdom, and in almost all the other countries of Western Europe, we find shorter products pipelines.

As the growth of products demand is expected to remain buoyant, coupled with the relentless growth of petrochemicals, it is a foregone conclusion that future developments will favour the laying of more products pipelines, either for adapting the more or less rigid structure of refinery products mixes, which is determined by peak demand for certain preferred products, to the fluctuating demand of the markets, or for supplying products directly to selected big consumer markets or individual large users of products. In certain agglomerations of industry and people, pipelines may also serve to lighten the load of rail, road, and shipping transport.

Though the economics and technology of gas trunk lines are different from those of oil pipelines, crude and products lines, the gas lines are, on the other hand, closely related for all con-

siderations of an energy policy. Gas trunk line networks do not carry natural gas only, but natural gas lines have progressively gained predominance economically. Their mere size and length justifies their separate discussion.

#### Natural Gas Trunk Lines

In Western Europe relatively important reserves of natural gas have been known and opened up for use for a long time. Italy and France have made the first efforts in this direction, but the creation of a pipeline grid of more than local or regional significance did not start before the World War II was over.

After the development of vast gas reserves in the north of the Netherlands, whose importance is great even when compared with other big finds in the rest of the world, natural gas has become available in Western Europe in quantities that far transcend the absorptive capacities of a single national market, so that big surpluses can be exported to neighbouring countries. This was the start of a new age for Western Europe, during which the transport of vast quantities of natural gas had to be tackled. At present, the very extensive West European grid of gas trunklines extends over about 40,000 km altogether. Of special significance are two big gas grids: the older one is that based on the gas reserves near Lacq in Southern France, which was built in 1956, and the newer one draws its supplies from the north of the Netherlands and was built in stages from 1964 to 1967.

Their trunklines are crossing highly populous areas with large energy requirements, which makes them different from the natural gas grids both in the US and in the USSR, in that their "trunks" have sprouted numerous spurs and branches for regional and local distribution. Furthermore, and this must be emphasised, these natural gas lines are connected with a number of other trunkline grids that do not carry natural gas but whose takeover by the natural gas supply system is foreseen.

It is to be expected that both the capacity and the overall length of West European natural gas trunklines will expand considerably during the 'seventies. Also, the inclusion of natural gas deliveries from the Soviet Union to Western Europe will lead to a number of important changes in gas transport. It is not only the Federal Republic of Germany, Austria, and Italy which have contracted for deliveries of Russian natural gas; also Switzerland and France consider the purchase of considerable quantities from that source, which all means that drawing-up plans for a sufficiently

widespread international pipeline grid becomes indispensable.

A striking feature of all these European pipeline systems is their supra-national character, which reaches beyond the borders of the Common Market. Thus, Swiss oil refineries are fed with crude through a spur of *Central-European Line* (CEL). Before the end of 1971, Austria will receive pipe-borne crude through *Adria-Wien Pipeline* (AWP), which branches off from *Trans-Alpine Line* (TAL) and thus draws supplies from a Mediterranean port.

### Supra-National Cooperation

Products lines, likewise, are no longer restricted to serving purely national requirements — they are increasingly being laid out as supra-national supply systems. Finally, natural gas trunklines cannot but operate across and beyond national borders, because there is no other form of transport capable of linking marketing outlets with natural gas reservoirs, whilst conversely, gas reserves could not be most economically exploited without trunk pipelines. Drawing natural gas from the Soviet Union through direct pipe links between the West European natural gas grid and that of the Soviets might even create a permanent system of communications between West and East European natural gas supplies.

In some respects, the shipping of liquified natural gas in specialised ocean tankers across the Mediterranean may be termed an additional linkage between a number of West European and North African gas trunk lines, forming a first approach to the emergence of an inter-continental energy grid network.

The international character of pipeline transport underlines impressively the gradual merging of European national economies together with the impossibility to overcome energy supply problems within one nation. The integrating effect of European pipeline grids irradiates far beyond Western Europe's borders and, from the spring-board of supra-national energy grids, opens up vistas of inter-continental linked grids via the tentative projects now under discussion for a direct adhesion of certain North African and Middle Eastern producing countries to the West European pipeline grids, which can no longer be termed utopian.

### Cooperation of Companies

Tasks of the vastness indicated are not only affecting the interests of several states, thus making it necessary that they increasingly agree upon coordination of their national energy plans, but

their practical execution impinges, at the same time, on the interests of a multiplicity of companies.

Except for *Central European Line* (CEL), which is owned and operated by ENI of Italy only, all West European pipeline systems are owned and operated by partnership companies, in some of whom more than a dozen individual concerns are holding an interest. Cooperation of this kind between companies of varied sizes, different ownership structures, and different national origin is a remarkable example of cooperative solutions for fundamental energy problems.

There is an additional reason why cooperation between companies in building and maintaining pipelines deserves special attention: conditions for creating and operating pipelines in Western Europe are usually much more difficult than, for example, in the US — because of the great topographical variety of the old Continent and of its higher population and building density, which makes common efforts of many partners inevitable but also calls for a much higher rate of specific investment. During 1964–69, the West European oil industry has invested in pipelines about \$1.2 bn, or 4 p.c. of its total investment in new fixed assets. Future requirements of new pipeline connections, which have been discussed above, will need a very high rate of investment which is much easier to mobilise by cooperation.

### Pipeline Trends

The relentless growth of the demand for hydrocarbons has led to a forecast of a West European oil consumption of altogether 1.0 bn tons by 1975, which is as much as the whole world has used in 1960, and this is bound to make for an equally relentless expansion of pipeline laying—of all three types of line, for crude, products, and natural gas—inevitable during future years. In this context, it is worth pointing out that the borderlines between different types of pipelines may gradually fade. Designers are at work studying the possibility of multi-purpose pipelines, which might greatly affect the economics of pipeline construction and operation.

Drawing up plans for big new crude trunklines is only possible through designers taking heed of a number of fundamental new trends in oil transport. Especially the spreading use of giant ocean tankers cannot fail to be a determining influence on the forms and manner of building new pipelines. It is well known that handling and unloading such enormous tankers require great depths of water for their berthing, and only a few European ports are suitable, or can be adapted, as deepwater terminals. Those that are suitable in

this respect will become much more important as crude oil terminals and as preferred locations for a new refineries, which makes such ports also the natural starting points for a great number of products lines for supplying the interior of the Continent.

New refineries to be built in or near such ports will be of the supplementary type, having huge capacities and highly flexible production facilities, whose location on the coast makes them geographically eminently suitable for international exchanges of products. Their supplementary functions in regard to inland consumer markets can be optimally engineered through direct products lines grids, for which the first examples are the *Rotterdam-Rhine* and *Rhine-Main* products pipeline systems. In addition, growing petrochemical manufactures require regular supplies of their base stocks by pipeline, both from refineries which produce these materials and between various chemical plants.

#### Relations to Transport Forms

Lastly, in a growing number of cases conditions have matured for making products grids desirable between certain inland refining centres and their nearest regions of big consumer demand and/or individual big users of products. However, in some of these cases, competition by other forms of transport is still playing a part.

Rising oil requirements, which are to be expected, will also increase transport requirements for mineral oils and thus accelerate the rate of pipeline construction. In this context, it has to be pointed out that, notwithstanding its fast growth, the extent and the density of West European pipe-

line networks, measured by international data, are all but highly advanced.

Pipelines lighten the load upon other forms of transport and help to balance the economic infrastructure of transport through taking over freight volumes from road, rail and inland shipping traffic. It seems inconceivable to leave the older forms of transport—already greatly overloaded—to handle not only existing transport volumes but additionally also the present volumes of crude and petroleum products requirement: a breakdown would probably be inevitable. Operating conditions of pipelines, because of their enormous capacities and their great economies of scale at high and full load factors, on the contrary, help to keep product prices and all energy costs low. As a rule, pipelines are therefore not really competing with the older forms of transport but are their indispensable supplement. Moreover, the fact that pipelines exist and operate has not reduced the volume of oil transported by other and older forms of transport. On the contrary, since pipeline routes are rigid and unchangeable, distribution of mineral oils by other forms of transport has grown and will grow further, and will remain indispensable.

#### Aims of the Community

The European Commission has always been aware of the special importance of pipelines in the European energy balance. Therefore, it has already tried to deal directly with pipelines and their construction in its "First Orientation for a Common Energy Policy"<sup>1</sup>, in connection with their

<sup>1</sup> First Orientation for a Common Energy Policy. Communication of the Commission for the Council, submitted on December 18, 1968. Special Supplement, Bulletin of the European Communities, No. 12, 1968.



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special problems connected with the free exchange of goods and services between EEC member states, the freedom of claiming residential rights, and the investment of funds in the oil sector of the economy.

In order to achieve the most important aims of the EEC Treaty concerning the creation of a common market, also in the field of energy supplies, it will be necessary to dismantle the obstacles in the path of this endeavour due to technical regulations applying both to the various forms of energy and especially to the technical equipment for their production, their use, and their transport. The Commission therefore has worked out proposals for the harmonisation of safety regulations for the transport of oil by pipelines (which are particularly relevant also to the problems of environmental pollution), and already in January, 1968, it presented to the Council of Ministers draft guidelines<sup>2</sup> for this purpose, which are still under discussion by the competent bodies.

Following on from this, the Commission has also emphasised the need to study existing practices of pipeline transport, including the calculation of transport charges, and to harmonise them if this should be found indispensable.

As to residential rights, the Commission calls for measures to obviate effectively all forms of discrimination, particularly through laying-down objective criteria to be used by the national authorities and government agencies in using their powers, e.g. for applying existing prescriptions for granting licences for energy transport that is tied to transmission lines, including specifically oil and gas pipelines.

To achieve these purposes, the Commission deems it to be a first necessity to make a comparative study of all rules and regulations in force in member states for the transport of hydrocarbons by pipelines, both through statute law

<sup>2</sup> Proposal of a Guideline of the Council for the Harmonisation of Statutory Regulations by Member Countries regarding technical safety measures for building and operating oil trunk pipelines. Submitted to the Council by the Commission on August 5, 1968. Bulletin of the European Communities, No. C 123/6 of November 26, 1968.

and by administrative practice. This study has been started by a working group of experts drawn from all member states, who sit under the guidance of the Commission and have been briefed to draw up a comprehensive index of all the rules applying in member states to pipeline transport, of all the relevant administrative practices, and of subsidies for pipelines, where they exist.

### Community Companies

As to investment activities, finally, the Commission has proposed to institute the statutory duty to report to the Community authorities all new and pending projects, for purposes of information only. A draft decree proposal<sup>3</sup> on this subject has also been submitted to the Council of Ministers, and it is still under scrutiny by the competent committees. An appendix added to this draft decree specifies, with the help of technical criteria, the types of investment projects, including trunk pipelines for liquid and gaseous hydrocarbons, in which the Community must be interested, so that the Commission deems it necessary to collect up-to-date information on them.

For a number of reasons, the Community believes it to be desirable to set up a legal framework under Community Law for certain industrial activities. Community Companies, as defined by the Treaty on forming the European Atomic Community, seem to be a suitable statutory form for this purpose. Company articles as described there would enable industries in the Community to cooperate in certain cases under preferential conditions. This concept is also sufficiently flexible for use in various practical cases, especially in that of the oil industry. Community Companies, for example, might be suitable contractors and/or operating firms for crude trunklines, especially in cases of projects, whose technical risks are high, or which will have to fulfil special requirements about safeguarding uninterrupted supplies, making it necessary to make investments that would be too high for average commercial considerations.

<sup>3</sup> Proposal for a Council Decree on Reporting about Investment Projects of Interest for the Community in the field of Oil, Natural Gas and Electrical Power. Bulletin of the European Communities, Vol. 13, No. C 11, January 29, 1970, pp. 29 et seq.



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