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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

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DEVELOPMENT IN CEMENT AND CONCRETE INDUSTRIES: ECONOMIC ASPECTS 1/

by

J.K. Rasmussen
Managing Director
A/S Aalborg Portland-Cement-Fabrik
Copenhagen
Denmark

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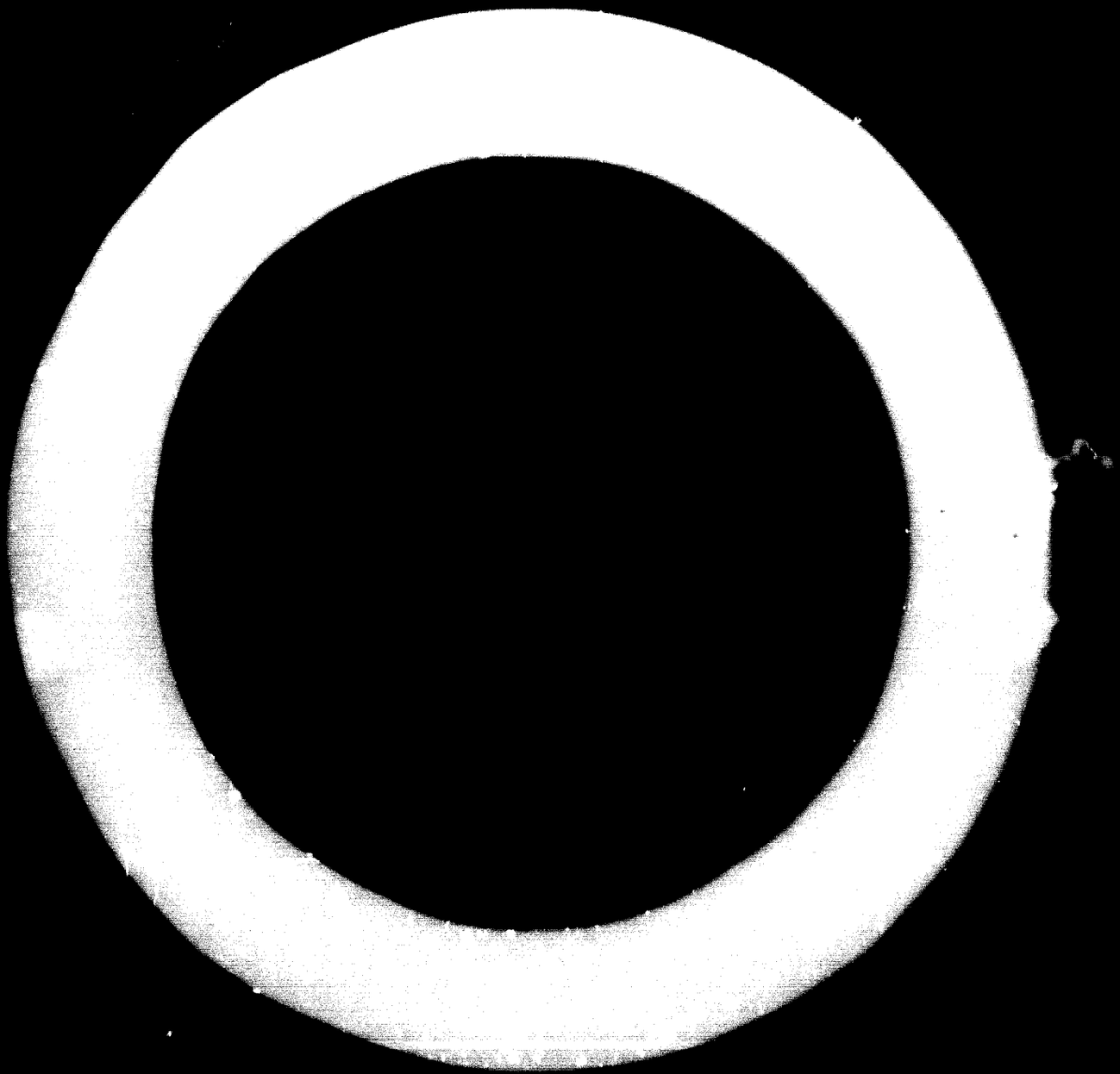

Even if the cement industry is very often referred to as a key industry, it is very important that in this connection it is expressly linked together with the industries that convert the cement into a product that is useful for the ordinary citizen.

Cement is a basic product, whose good qualities and low price make it the natural starting point of a long number of applications, such as contractor's work, with concreting on site, or prefabricated modules for constructional purposes. All the important fields of applications have one feature in common, viz. that in reality the cement is used as a strengthening factor in the production of concrete, which, in turn, may be a finished product or may be subject to further treatment.

From this it appears that cement serves a specific purpose only if an interest can be aroused in using it for concrete. There are many conditions that have to be fulfilled to reach that far, and here only a few are mentioned: Whoever uses the cement must be able to rely on its good quality.

This condition, viz. that the quality has to be in order, means that it is necessary to find out what cement qualities are suited for the production side, and what qualities are suited for the consumers' side. Next, ways must be found to control the production in such a way as to turn out exactly the product which is required and which the consumers need; furthermore, it is also necessary to carry on research and to develop the product intended for the consumers' side, in order to be able to convert the good qualities given the cement at the cement works into those applicable concrete qualities which the final consumer, viz. the people living in the houses, etc., appreciate most, whether it is durability, appearance, strength, etc.

This necessitates a certain [illegible] in which a correct balance must be established between the qualities which the consumers find most important, and the costs incurred by fulfilling the wishes of the consumers; on the other hand, of course, the consumers have to decide if their wishes as regard quality are so important that they justify a higher price.

One of the fields which have been important lately is the requirement of homogeneity, after the purposes to be achieved by the production have been decided upon; this homogeneity is to secure that the customer achieves the same results as those he achieved last time, because only then is it possible to rationalize and, particularly, to industrialize the production of concrete.

It is but natural that such development work should lead to special requirements as regards the arrangement of the cement producing installation; for instance, it appears that we have to spend a lot more on the homogenizing of raw materials and intermediate products than what was previously considered necessary.

The demand for big units for these purposes may to some extent be eliminated, or at any rate diminished, by introducing a better method of controlling the production of [illegible], and this makes it imperative to study closely what is actually happening when cement is produced and to find out what factors determine the qualities of the finished product as well as the economy during the production.

One of the means that has attracted much attention lately is automation, which ensures a much better supervision and control of the machines and the course of the production than what has so far been known; in addition, automation should also make it possible to discover the irregularities in the production, which are quite inevitable, at an earlier stage, so that they may be corrected in time to prevent accidents as regards quality or economy. However, I do not exaggerate when saying that there is still a long way to go; but even the first achievements of the process of automation which may often cost more than 25 per cent of the total cost(in connection with automation) will turn out to be important gains by way of a better knowledge of the technique used and the rules of control to be applied, also if the production is controlled manually.

All these efforts in connection with the development of quality and control as well as rationalization of the production are costly and difficult, and it is therefore necessary that the results of such investigation and development should be exploited in a market of sufficient size to reimburse the high costs. And therefore this line of thought leads on to the necessary of operating with relatively big units.

It is no use, of course, to make a superior quality and an excellently homogenous cement, unless we are sure that the additives to be used in order to exploit the good quality of the cement are available in the quantities required and at the right price; and it goes without saying that practical know-how should be available, too.

All this should finally result in a construction or a construction element which is so highly appreciated by the other parties of society and so competitive as regards, say, the price that the consumers prefer to use concrete rather than other materials, or perhaps build nothing at all.

I will not go into detail about the long number of factors that have just been referred to - things are far more complex; I only wish to point out that, as regards the value, the cement is but a small part of the finished product, but an indispensable one, and therefore the basis for the success of the cement production is closely connected with the consumption of concrete; and the concrete produced industrially may turn out to be a very valuable sector.

The prospects of the individual cement industry also depend on the possibilities and the abilities of the individual company to secure the necessary share of the cement market in the district of that company.

In this connection many conditions have to be considered, technical as well as financial, and also the situation of the market.

Cement is cheap, and the costs of transport and handling are heavy in comparison with the price. This previously resulted in the establishment of a large number of rather small cement works, which covered the supplies of local and, as regards transport, protected markets, and, further

in [illegible] relatively small [illegible] by the large handling [illegible].

Through the latest [illegible] the [illegible] production of cement has developed [illegible] such units as a prerequisite of reducing the [illegible] with other cement industries, and also as a [illegible] contribution towards the improvement of the competitive [illegible] of concrete as compared with other building materials.

The cement industry is a highly capital requiring one. In practice, the financing cost often amounts to 5-10 dollars per ton of current production of a new plant; and so it is of vital importance that the cost of construction is highly degressive in comparison with the size of plant. Reference is made to Picture No. 1. In addition, the direct cost of each ton is lower for the big works. The result of this trend is that the unit sizes now reckoned with are 2-3,000 tons; as regards the newest dry kilns, the capacity is even 4,000 tons or more per 24 hours, whereas a works having a capacity of 500 ts/24 hrs was considered a big and highly economical unit only 15-20 years ago.

It is only natural that these advantages obtained in connection with large-scale production should entail the necessity of large sales; and therefore the cement industries must be interested in expanding their markets as much as a sound and economical policy permits, either by enlarging the geographical district supplied, or by increasing the consumption in that district.

A geographical expansion may be desirable or undesirable, dependent on, e.g., the economic conditions, the extent of the raw material resources, etc.; however, when it is not necessary to make any special considerations, it is probably realistic to assume that the demand for the big production units, and the economic risk involved, accelerate the development which is taking place, also towards a change in the structure of the markets on the basis of a rationalized transport and distribution to the centres of consumption. In view of the [illegible] development that has been seen within bulk transport, it will be [illegible] to think about the possibilities as regards a rational [illegible] of the production of cement that such

- [illegible] -

and development [illegible] taken to secure [illegible].

Progress [illegible] give you some [illegible] in the bulk [illegible] in a number of [illegible]. The overseas transport sector has completely changed in recent years, too.

Before the last war, and up into the 1950s, 1,000 tons of bagged* cement in a single ship for overseas destinations was considered a great [illegible]. Nowadays, however, we see a trend towards shipments of cement of [illegible] of 20-30,000 tons per lot, at rates which are much lower than what is charged for delivery of cement in bags to the same destinations. This is connected with the very efficient and fast loading and unloading, of course, which bulk carriers offer, up to perhaps even 1,000 tons per hour. In return, it is necessary for the sender as well as for the receiver, and thus a suitably large area of consumption, to be located at and close to deep-water harbours, and further, it is necessary to invest rather considerable sums in the handling installations required to deal with quantities of that order of magnitude.

Of course this often leads to a solution that has been applied in various cases, and especially where suitable raw materials are not easily accessible or not available for the production of cement, viz. in clinker mill installations near the centres of consumption, and this seems to be particularly attractive to works situated in such way that they may have some sort of a shuttle service back to the geographical area where the clinker comes from.

If certain cement works are now burying their wish to establish an export, this is parallel with the effort to secure an increase of the consumption of cement in the concrete market area. Such an increase will often seem to be a condition for the existence of the local industry in competition with other, technically well-equipped, works.

Thus the cement industry must be positively interested in any progress that the cement consuming industries may enjoy, therefore, interests are parallel, and in certain cases to such an extent that connections of an economic and technical nature are established, as well as co-operation

*

within [illegible] for example, this [illegible] a concrete [illegible] that may arise from such [illegible] in [illegible]. An example [illegible] asbestos cement works, which [illegible] only Danish producer of that product.

There is no reason to conceal the fact that a vertical integration may also be used in the competition between the cement producers. In that case, there is a considerable risk that the concrete industries are not remunerative, and that may hamper a desirable growth of those industries because the finished product might be sold at dumping prices. Such conditions are not a permanent phenomenon, of course; but an unwise price policy, in which even one link of the chain does not come up to acceptable business standard, may hamper the development, and should therefore be avoided, if possible.

The reflections and information given below will, unfortunately, describe the development in the industrialized countries only, with a few remarks from other areas.

This is due to the fact that I have not had access to any statistics from the developing countries; further, it may be interesting to see how the trend has developed in those areas where the cement consumption per capita has become great; and finally, the trend may be influenced the policy which the individual countries wish to pursue as regards the areas where it is advisable to industrialize, and where manual work must be provided as a means of provisional employment.

Let us look at the development of the consumption of cement first. Here, it is natural to consider the consumption per capita, even if it is, of course, the total yearly tonnage within the reach of a cement works which is of a special, and short-term, interest to the individual cement works. However, the consumptions of cement should also be compared with the total gross national product.

In principle, the development [illegible] consumption of cement follows the same line as the development with other products, i.e. a rather slow start and then [illegible] increase [illegible]. In the case of Denmark, this is shown on Picture No. 2, which, in levelled form, [illegible] as Picture No. 3. This is the annual consumption in tons, and one must imagine, of course, what the future development will be like. There is a general idea that every product has a building-up period, an active period at top, and finally a decline when the product no longer appears to be interesting to the consumer. The time axis on the cement side is very long, however, and as far as we can see, we have not yet reached the peak in the West European countries; there is no doubt, of course, that such a peak must be reached. In the case of the developing countries, however, the normal situation is that we find ourselves at a very low point of the building-up curve, but for some of the countries it is characteristic that the steep increase is experienced already from a lower level than has been the case in Denmark, confer Picture 4. This may be illustrated by the table of the consumption per capita on Picture 5, from which you will see the development of the consumption from 1950 to 1970, in countries such as West Germany, Denmark, and USA, and also in some developing countries (Brazil, Morocco, Egypt, Thailand, and India). It is interesting to note that the consumption level per capita in USA was very high in the beginning of the period, whereas it has shown but a modest increase; this is undoubtedly connected with the fact that in view of the high wages in USA, they find it more profitable and attractive according to American standards to use other building materials (steel and wood). As far as the developing countries are concerned, we should be careful about applying the statistics, because alterations in the political situation are bound to entail changes in the economic activity.

Therefore, it will be natural to compare the consumption of cement and the economic activity, for instance as expressed through the gross national product. This gross national product is described on the basis of the information from "Statistical Year Book 1970, United Nations", and it appears how USA is still in a strong, leading position, but that the consumption of cement is much lower than in Denmark and West Germany

[illegible] believe. We [illegible] countries [illegible] expressed in a [illegible] on Picture No. 7. From this it appears that there is an excellent correction between these sectors for the European members of the OECD during the period from 1950 to 1965, four years included, provided we convert the values into a fixed money value. A corresponding factor applies for the individual countries, too, and will probably also apply for a number of developing countries; but the interrelations will be different, of course, dependent on the composition of the national product of the countries.

Some sort of conclusion may be drawn from such comparisons, however; Picture No. 8 for instance shows a comparison between the relative development of the gross national product of Brazil and Denmark, and the relative developments in the consumptions of cement. There are great variations from year to year, but if the development over the period is considered as a whole, we see very clearly how the gross national product developed almost the same for each country per capita, whereas the consumption of cement in Brazil, where the absolute level is considerably lower, shows an increase that is somewhat greater than the increase experienced in Denmark.

So far, we have discussed the development in the consumption of cement without paying any attention to the application of the cement consumed; and what has been said so far is aimed at pointing out certain methods which might be applied [illegible] as seen from a national point of view or a cement producer's point of view.

We may also [illegible] various sectors of which apply [illegible] to do so in the case of certain [illegible]

[illegible]
[illegible]
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[illegible] the various [illegible]
occupied [illegible]
[illegible]cteristics [illegible] where we [illegible] with [illegible] vari-
ations among the countries [illegible], the different languages as well as the
economic conditions in the various countries must be taken into account.
To illustrate how different things may be, the brochure has a figure which gives the index of the development within construction in Denmark, calculated on the basis of the value, and thus not on the basis of the consumption of cement. It appears that Denmark, which has so far been an agricultural country, has now reached the situation where investments in agriculture have come to a standstill more or less whereas the expenditure towards other constructions are increasing much more; you should note the steep increase in industrial construction until 1965, when a certain stagnation set in; at the same time, society developed in such a way that public building increased steeply and is still increasing. This is connected with the fact, of course, that the Danish society wants to spend an increasing part of its income on, e.g., the social and the educational sectors, a fact which must, of course, give rise to differences in opinion between industrial life, which is stimulated by competition, on one hand and the more humanistic part of society on the other.

The Development of the Concrete Industry

In many countries the marked development within the consumption of cement has resulted in the growing-up of an industry, which fills a function between that of the cement producer and that of construction site. This industry started with the production of pipes and other concrete goods and has later developed into an industry which also produces prefabricated building modules of full storey-height, and often having a span of up to 30 m. Another industry is the ready-mixed-concrete industry, which has shown enormous increases in many countries during recent years. As shown on page 26 of "Where Does the Cement Go?" these industries in the 12 European countries previously mentioned accounted for a total of 43% of the total consumption of cement in 1971,

[illegible] should be [illegible] that [illegible] figures [illegible]. show the [illegible] consumption. These [illegible] countries [illegible] were found at the lowest [illegible] and the [illegible] concrete production were Greece and Portugal [illegible] appeared in Sweden. We have tried [illegible] these differences represented in development, and on Picture No. 12 and the sketch we have shown the shares of ready-mixed concrete and concrete goods of the total consumption of cement in Denmark, Sweden, France, Spain, Greece, and Portugal in those years.

This development within the concrete industry has had the result, quite naturally, that the consumption of cement has become concentrated on a far smaller number of consuming points, and this, in turn, has made it possible to make the transport more efficient by switching over to bulk transport. On Enclosure 13 we have shown the course of this development in the six European countries and USA. As regards Denmark, the share of bulk transport within a period of about 10 years has increased from less than 1/3 to more than 2/3. It is difficult to say anything about the point of saturation, since cement for minor works, such as repairs and the like, will hardly be supplied in any way other than in bags; however, the development in USA shows that in that country the point of saturation was reached at 90%. In Sweden, too, the point of saturation seems to be found at that level.

To illustrate the importance of the concrete industry for the local society, we have collected some figures showing the development in Denmark:

In 1953, the consumption of cement within the concrete industry in Denmark totalled quite 200,000 tons, corresponding to about 17 per cent of the total consumption of cement. In the middle of the 60's consumption had gone up to 675,000 tons, corresponding to about 31 per cent, or about double the percentage, but more than three times the consumption of cement. Corresponding figures are reflected in the rate of employment, which amounted to 2,500 persons in 1953, or 0.6 per cent of the population, whereas the end of the 60's saw a rate of employment of 8,700 persons, corresponding to about 1.8 per cent.

As [illegible] produced in a factory, [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] possibility of [illegible] [illegible] [illegible] of cement [illegible] [illegible] periods of time without [illegible] [illegible] [illegible] [illegible] capacities.

The production of building products has reached a high level in [illegible] Europe, and one important contributory reason has been the wish to rationalize the whole building sector; this means that there is thus a means to secure the application of concrete in areas where it might traditionally be regarded as more profitable to use other building materials. And indeed the result is that in Denmark, for instance, we expect that in the years to come the carcass will be made by means of half the number of labour, including the labour used at the works producing the modules, as compared with the labour used per square meter of housing 10-15 years ago.

Finally, it might be appropriate to make a few filosophical remarks on quite a different aspect of development, viz. the relation between industry and society. It goes without saying that there is a number of correlations, but I feel there is a special reason today to mention two of them. One is the concept of environmental pollution.

Obviously a factory which is placed far away from large builtup areas is able to work much more feely as regards the pollution it causes in the environment by way of smoke and dust, noise, vibrations from blastings, etc., than a similar factory which is situated in a heavily built-up area.

All the new European factories have spent huge sums of money on equipment designed to protect the environment as much as possible, but in the US, for instance, we are witnessing a very pronounced tendency towards closing down a large number of cement works which are already in trouble because they no longer correspond to the efficient size, technologically, and which are therefore unable to pay the very high cost required by the protecting measures, viz. primarily huge dust precipitating installations on kilns, mills, etc.

The [illegible] is [illegible] to plan, [illegible] purposes of [illegible] run [illegible] may become [illegible]

Therefore, [illegible] described [illegible] large bulk carriers, [illegible] for a transl[illegible]ation of part of the world production of cement; in any case is it likely to result in a concentration of the structure of the production of cement.

[redacted]

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