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## The Cement Industry in Kenya

Kenya's cement industry consists of two firms, The Bamburi Portland Cement Company Limited with its factory at Bamburi near Mombasa, and The East African Portland Cement Company Limited with a factory at Athi River, South of Nairobi. Both are associate companies of large European concerns.

The older of the two companies is the E.A. Portland Cement which was incorporated in 1933 and started operating a grinding plant on the basis of imported clinker in Nairobi shortly thereafter. In 1958, the company took up the production of cement from local raw materials in its new factory at Athi River. The factory uses the wet production method and operates a modern rotary kiln. It has an annual production capacity of 120,000 tons.

The formation of the Bamburi Portland Cement Company Ltd., which before September 1st, 1966, was called British Portland Cement Company Ltd., was approved by special ordinance No.61 of 1951, for the purpose of constructing, at Bamburi, a cement factory. The company commenced production in 1954, and sold during its first financial year 23,000 tons of cement. The first two shaft kilns[1)] installed gave the factory an annual capacity of over 100,000 tons. Later, the capacity has been progressively increased. A third kiln was installed in 1955, shortly afterwards followed kiln no. four and five. The total capacity in 1958 was 350,000 tons. In 1961, a sixth shaft kiln was installed bringing the total capacity up to 400,000 tons. The dry production method is used. The Company has a Subsidiary in Mauritius and Associate Companies in Tanzania and Reunion. Subsidiary and Associate Companies operate storage and bagging plants. The Associate in Tanzania opened up a production unit last year at Wazo Hill near Dar Es Salaam with an initial production capacity of about 150,000 tons p.a.

## Locational Problems

The governing factor for the location of cement industries is the supply of raw materials and especially of limestone which contributes about 80% in weight to the total raw material inputs. Most cement factories are, therefore, located in close neighbourhood to the lime quarries. This can also be observed in the case of the Bamburi factory. The factory is located in the middle of very large deposits of Pleistocene coral limestone and close to Jurassic shales. Also the gypsum which is added at a proportion of 3 to 5% to the burnt ore is found not too far away at Roka, south of Malindi. The close vicinity to the main raw materials reduces the transport costs of them to the factory to a minimum.



1) Shaft kilns are vertical kilns as opposed to rotary kilns. They are usually smaller than rotary kilns.

The Athi River factory, on the other hand, has to transport its requirements of limestone from Sultan Hamud where an unusually magnesia-low crystalline limestone is quarried[1]. Sultan Hamud is 64 miles by rail from Athi River. The railage, we can estimate, makes the production of Athi River cement about 8% more expensive than the cement of a factory located in the immediate vicinity of its limestone quarries. It seems, therefore, that real or expected advantages in the form of closeness to the main market, more favorable climatic conditions, cheaper power through connection to the public net, more sufficient supply of water, nearby deposits of calcrete (cunkar, an impure superficial limestone which is used as secondary source of limestone) and closer location to the gypsum quarries around Garissa - the larger part of the gypsum supply of the factory comes from here being transported by road over a distance of about 220 miles to Athi River via Thika/Nairobi - have made the Athi River cement works one of the rare cases where a location for a cement plant has been chosen away from the limestone deposits.

Production - Consumption - Exports

Table I shows the development of production and consumption of cement in Kenya and the country's international and interterritorial trade in cement.

Table I: Production, Exports, Imports and Consumption of Cement
( 1000 tons )

| Year | Production | Domestic Exports[1] | Interterritorial to Uganda | Exports to Tangany. | Net[2] Imports + Re-Exp. | Local[3] Consumption |
|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1958 | 236.1 | 4.0 | 8.3 | 59.5 | 7.6 | 171.9 |
| 1960 | 335.8 | 42.4 | 7.7 | 104.7 | 1.1 | 182.1 |
| 1961 | 324.3 | 93.6 | 6.5 | 106.5 | 0.7 | 118.3 |
| 1962 | 338.1 | 103.9 | 11.1 | 100.8 | 0.9 | 123.2 |
| 1963 | 338.3 | 108.9 | 16.8 | 97.0 | 0.8 | 116.4 |
| 1964 | 415.4 | 171.4 | 13.2 | 148.6 | 0.5 | 82.7 |
| 1965 | 476.2 | 196.3 | 7.1 | 176.2 | 0.0 | 96.6 |

1) Outside East Africa
2) From outside East Africa
3) Local Consumption (7) = columns (2) - (3) - (4) - (5)+(6)

Sources: East African Customs and Excise, Annual Trade Reports for trade figures;
Statistics Division of the Kenya Ministry of Economic Planning and Development, Kenya Statistical Digest, Vol. I, No.1, Sept. 1963 and same author, Economic Survey 1966, p.46 for production figures.
The estimates for local consumption disregard stock changes.

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1) W. Pulfrey, The Geology and Mineral Resources of Kenya, Geological Survey of Kenya, Bulletin No.2, Government Printer, Nairobi 1960, p.21

The consumption of cement is closely related to the amount of building and construction going on in the economy and this, in turn, depends on the level of investment in general. The preparations before independence to hand over the administration to Africans brought about a high degree of unsecurity among the business community which consisted - and consists today - nearly entirely of European and Asian firms. The result was a sharp drop in business investment and in new residential housing developments after 1960 and a parallel fall in the home consumption of cement. The cement consumption, which from 1955 to 1960 had been rather stable between 170,000 and 190,000 tons per year, fell to 83,000 tons in 1964 which is less than 50% of the 1960 level. Only in 1965, there was a slow recovery of the Kenya cement market, a trend which has been more pronounced in 1966. The fluctuating cement sales are a rather good indicator of the development of the economy in general. The expectations for this year are also optimistic and indicate that the trough in the economy immediately before and after Uhuru has been overcome and confidence restored.

If we now look at the production figures since 1958, we get quite a different picture from the consumption sequence. The production of cement between 1958 and 1965 was more than doubled. As imports went from very small to virtually zero during the period under consideration, thus not significantly influencing the total picture, the diametrically different developments of cement production and home consumption must be entirely due to increased exports. The domestic exports outside East Africa as well as the interterritorial exports to Uganda and Tanganyika increased by leaps and bounds. If we now turn to Table II, we can see the regional distribution of the exports. Among the interterritorial exports Tanganyika is much more important as an importer of Kenya cement. This is easy to understand if we remember that Uganda has its own cement works at Tororo and restricts the imports of cement to about 10% of its requirements. This is to protect the Tororo factory against competition from Kenya which would certainly be noticable taking into account the much better quality of the Athi River products and the unused capacity of this factory. Tanganyika, on the other hand, did not have its own cement factory until the middle of 1966 when the Tanganyika Cement Company Ltd. started production at its new factory at Wazo Hill. Between 1958 and 1963, the cement consumption fell also in Tanganyika, not as abruptly as in Kenya, though. Still, the Kenya sales to Tanganyika could be increased until 1961 by substituting imports from overseas which in 1958 amounted to about 70,000 tons. By 1965, imports into Tanganyika from overseas had dropped to preactically zero. After 1963, the Tanganyika cement market expanded rapidly, mainly as a result of the vigorous housing program of the Tanzania Government. Consequently, Kenya was able to increase its exports to Tanganyika between 1963 and 1965 by 82%. in weight.

Even faster than the interterritorial exports rose the exports of Kenya cement outside East Africa. The domestic exports increased continuously during the period from only 4000 tons in 1958 to nearly 200,000 tons in 1965. An analysis of the direction of domestic exports shows that the islands in the Indian Ocean, especially Mauritius and Reunion, are the largest buyers. The Bamburi Cement Company has built up an outstanding sales organization to supply the markets on the islands and in the countries adjacent to the Indian Ocean. The transport to Mauritius and Reunion can be carried out in bulk by two Company-owned cement ships which reduces the transport costs to a minimum. The Subsidiary Company in Mauritius and the Associate in Reunion have both storage and bagging facilities.

Due to the location of the Athi River factory and the import restrictions imposed on cement by Uganda, practically all its sales go to the local - Nairobi - market. This explains why the Company suffered serious losses in sales during the last year as a result of the crisis in the building industry.

The previous statements and the figures on table II indicate that the Kenya cement industry as a whole is extremely export orientated.

Table II: Cement Exports (1000 tons)

| Country | 1958 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 |
|---|---|---|---|---|---|---|---|
| Uganda | 8.3 | 7.7 | 6.5 | 11.1 | 16.8 | 13.2 | 7.1 |
| Tanganyika | 59.5 | 104.7 | 106.5 | 100.8 | 97.0 | 148.6 | 176.2 |
| Total Inter-terr. exports | 67.8 | 113.4 | 113.0 | 111.9 | 113.8 | 161.8 | 183.3 |
| Mauritius | 0.3 | 24.9 | 46.5 | 42.8 | 31.0 | 46.9 | 69.3 |
| Reunion | 1.0 | . | 9.6 | 9.9 | 12.7 | 44.9 | 63.4 |
| Aden | . | 2.4 | 11.4 | 23.7 | 24.1 | 22.3 | 16.8 |
| Somalia | 0.1 | 1.1 | 2.5 | 7.6 | 14.0 | 34.5 | 14.6 |
| Madagaskar | . | . | 4.3 | 1.6 | 2.6 | 2.9 | 14.0 |
| Seychelles | 0.3 | 0.6 | 0.7 | 0.7 | 0.8 | 1.0 | 3.0 |
| Zanzibar | 0.7 | 2.4 | 3.5 | 4.6 | 2.8 | 2.1 | 3.1 |
| Rwanda | . | . | . | . | . | 0.5 | 2.2 |
| Burundi | . | . | . | . | 0.1 | 3.8 | 2.0 |
| Total Domestic Exports | 4.0 | 42.4 | 93.6 | 103.9 | 108.9 | 171.4 | 196.3 |
| Total Exports as per cent of Production | 30.4 | 46.4 | 63.7 | 63.8 | 65.8 | 80.2 | 83.9 |
| Interterrit. Exports as per cent of Production | 28.7 | 33.8 | 34.8 | 33.1 | 33.6 | 39.0 | 38.5 |

Source: Annual Trade Reports

This export orientation increased over the years until 1965 to over 80% for Kenya and close to 90% for the Bamburi factory alone. Such a high degree of dependence on exports is unknown to any manufacturing industry in a developed country. In Kenya it has on a similar scale only one counterpart in the soda works of Magadi to which the Bamburi plant is similar in several respects and which will be analysed later. But there are some marked differences between the Magadi soda works and the Bamburi factory. Cement in contrast with soda, is very vulnerable to expensive transport because it is a relatively low-priced commodity and its raw materials are found rather frequently. Notwithstanding these limiting factors for large exports, the Bamburi factory has had a surprising success on its exports markets in the past. This is due to a combination of a number of positive factors which are probably unique in this concentration among the manufacturing industries in East Africa: it has a cheap and practically unlimited supply of raw materials of good quality

nearby, the unskilled part of its labour force is still rather inexpensive, the technical and administrational management is experienced and in constant contact to the world cement industry through the financial ties of the Company to two of the largest cement concerns in Europe. On the sales side, the location is very favourable for taking advantage of low-cost sea transport in bulk to relatively near export markets which do not have their own cement industries. All these factors permitted a rapid expansion of the Company and with this the utilization of considerable economies of scale.

Prices

An approximate indication of the export prices of cement is given in the Annual Trade Reports of the Customs and Excise Department of the EACSO. (table III).

Table III: Total Value of Exports and Value per Ton (in 1000 £ and E.A. Shs, respectively)

| Year | Domestic Total Value (1000 £) | Exports Value per ton (EA Shs) | Interterritorial Uganda Total Value (1000 £ ) | Value per ton (EA Shs) | Exports Tanganyika Total Value (1000 £) | Value per ton (EA Shs) |
|---|---|---|---|---|---|---|
| 1958 | 33 | 165 | 85 | 205 | 561 | 189 |
| 1960 | 207 | 98 | 70 | 182 | 729 | 139 |
| 1961 | 418 | 89 | 58 | 178 | 681 | 128 |
| 1962 | 470 | 90 | 99 | 178 | 565 | 112 |
| 1963 | 503 | 92 | 149 | 177 | 538 | 111 |
| 1964 | 802 | 94 | 119 | 180 | 764 | 103 |
| 1965 | 939 | 96 | 68 | 191 | 880 | 100 |

Source: Annual Trade Reports

The average ton-price f.o.b. for cement exports outside East Africa was 165 shs. in 1958. By 1961, it had been reduced to 89 shs. and is since then showing a slow increase. An important factor which made these price decreases after 1958 possible was the introduction of bulk exports by the Bamburi factory. Only in this way could the foreign competition on the export markets be met. This came mainly from Eastern Europe and often offered its products at very low prices not dictated by profit considerations. The export prices of Kenya cement to Tanganyika showed a continuous decrease over the whole period and were in 1965 only slightly higher than the average domestic export prices. The export prices to Uganda, on the other hand, were considerably higher during the whole period than the prices for cement sales to other countries (except for similarly situated countries, like Rwanda and Burundi), because the market in Uganda permitted these higher prices.

The cement prices for local sales are generally higher than the export prices, partly because the quantities sold are smaller and only a small part is sold in bulk (under 10% of the total local sales), partly because the higher profits made on local sales are used to subsidize certain exports. It is not possible to separate the relative weight of both factors, but we can take it for granted that the rapid expansion of the Bamburi factory was assisted by this policy which, in turn, allowed economies of scale from which also the local market benefitted. The ex-factory prices for local sales as per the end of last year were 187/- shs per ton at Bamburi and shs 222/- at Athi River.

Cost Structure of the Industry

There have been several studies made on the cement industry in different countries where certain indicative ratios on the structure of cement factories have been calculated[1]). Similarly to the method applied in these studies the cost structure has been calculated for the two Kenya factories for comparative purposes.

Table IV: Composition of Unit Cost for Cement Production in Selected Countries and Kenya (in per cent of total cost)

| Item | Germany[a] (Fed.Rep.) | U.S.S.R. | U.S.A. | India | Kenya[c] Bamburi | Athi River |
|---|---|---|---|---|---|---|
| Depreciat. | 21.6 | 9.6 | 22.5 | 13.9 | 8.5 | 12.7 |
| Wages | 8.2 | 22.3 | 13.9 | 12.3 | 18.4 | 13.9 |
| Fuel | 21.0 | | 14.3 | | 22.7 | 19.5 |
| Power | 12.5[b]) | 37.1 | 12.6[b]) | 34.0 | 12.8 | 4.9 |
| Others | 36.7 | 31.0 | 36.7[b]) | 39.8 | 37.6 | 49.0 |

a) Dry process plant with 100,000 tons per year capacity; item "others" includes cost for raw materials, packing, maintenance, overhead, taxes, interest on fixed capital, social security contributions and miscellaneous.

b) Includes direct material, maintenance, overhead, interest on fixed capital, and miscellaneous.

c) The figures have been computed as nearly as possible to correspond with the figures given for the other countries. Real financial costs have been excluded and an 8% interest on the book value of the fixed assets included, instead. Item "wages" includes non-cash wages.

Sources: United Nations, Studies in Economics of Industry, No.1, Cement/Nitrogenous Fertilizer Based on Natural Gas, New York 1963; for data on India: U.N. Economic and Social Council, Economic Commission for Africa, Conference on the Harmonization of Industrial Development Programmes in East Africa, Lusaka, The Cement and Allied Industries in the East African Sub-Region, P.46; estimates for Kenya on the basis of own calculations.

The main cost items in the cement industry are fuel and power, depreciation and wage costs. They take between 50% and 70% of the total costs in all the countries included in the comparison. It is not surprising that the cost structure of the Kenya plants comes close to the U.S.S.R. and India examples with low figures for depreciation and a relatively high labour component. This is more pronounced in the case of the Bamburi factory which has been until now working entirely with shaft kilns which are more labour intensive than rotary kilns. A rotary kiln is used by the Athi River Factory. The relatively high depreciation in Athi River is also due to the fact that the factory worked at about 2/3 capacity only, which gives more weight to the fixed cost elements i.e. those which do not change with output.

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1) see sources of table IV.

It is interesting to note that the fuel cost of the Bamburi plant is relatively more important than that of Athi River although Athi River is using the wet process of production which requires a higher energy consumption than the dry process utilized by the Bamburi plant. In fact, to produce 1 ton of cement the Athi River factory requires about 1.3 mill. kcal against 980,000 at Bamburi. A disadvantage for Bamburi is that it uses imported coal for its fuel requirements which is more expensive per unit of energy generated than fuel oil, especially after the supply of the South African coal has been interrupted.

The high incidence of the "other" costs at Athi River may very well be partly the result of its unfavorable location with regard to raw materials entailing a high amount of transport costs.

Capital Equipment, Labour Force and Output

We have mentioned before that the degree of capitalization is different in the two Kenya cement factories because different techniques of production are applied. This has been expressed in terms of depreciation on fixed capital as a percentage of total cost. We reach the same result if we relate the amount of fixed capital invested to capacity.

By the end of 1965, Bamburi showed an investment in fixed assets at cost of Shs 150/- per ton of capacity against about Shs 390/- in Athi River, which is a relation of 1 : 2.6. The value of fixed assets per ton of output differs considerably between the two plants not only because of the techniques of production are not the same but also because the two factories do not have comparable capacities. The investment cost per unit of output decreases in the cement industry with the size of the plant. Calculations for other countries show that a cement factory with a yearly capacity of 100,000 tons requires an investment per unit of output which is about 50% higher than in a 400,000 ton plant[1]. From this point of view, large cement plants are more economical especially in countries where capital is the scarce factor of production. The Athi River plant has a very high fixed capital investment also in relation to comparable companies in Europe. The U.N. study e.g. reckons for similar plants of a similar size in Germany with a fixed capital investment of ca. 206 Shs per ton of capacity[2]. In calculating the capital requirements per unit of capacity one further point has to be taken into consideration. It is possible that companies with a high amount of capital per unit of capacity output show a lesser degree of capitalization if differences in the time period of the usage of the fixed assets are included in the comparison. We can do this by relating the annual costs of the capital to the capacity output. Capital costs are here to be the costs incurred by employing fixed capital assets, i.e. mainly depreciation, interest on fixed capital (assumed to be a flat rate of 8% on the book value), insurance premiums for fixed capital assets, and costs for repair and maintenance of the fixed assets. The ratio between Bamburi and Athi River is also here 1 : 2.6 which confirms our previous statement that the Athi River plant is about 2½ times as capital intensive as the Bamburi plant.

The amount of fixed capital invested per ton of capacity output is equal to the average capital/output ratio if a plant is working at full capacity. This was true at the end of 1965 of

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1) United Nations, Studies in Economics of Industry, op.cit., p.3, table 2

2) ibid, p.3

the Bamburi plant. If we take output in terms of value ex factory, we get for Bamburi an average capital/output ratio of about 1.5. The Athi River plant was not working at full capacity thus increasing the amount of capital necessary to produce one unit of output above the level which could be attained at a full capacity production. In other words, the Bamburi plant had to employ a smaller amount of fixed capital to produce one unit of output and was thus using un scarce factor of production, capital more economically than Athi River.

If we take output in terms of value, however, the higher ex-factory price per ton of cement at Athi River inflating the denominator of the fraction again lowers the capital/output ratio to a value of about 2.4. For purposes of economic policy the concept of the marginal capital/output ratio is more useful than the historic average capital/output ratio. It is very difficult to get figures for the marginal capital/output ratio because it is no fixed figure and changes greatly depending on by how much the output is to be increased. We can assume, however, that in the case of Athi River, until the factory reaches full capacity production, the additional capital for the next 30,000 tons of cement p.a. will be minimal and the marginal capital/output ratio close to zero. In the case of the Bamburi plant an estimate is more difficult to make. Additional output will, no doubt, require additional investment in plant and machinery which may well be higher - considering the rising world market prices for new machinery and the change to more capital-intensive rotary kilns - than the investment per unit of output in plant and machinery in the past. Part of the existing investment in buildings and social capital will not have to be extended to the same degree as output so that overall the marginal Capital/output ratio will not be much higher than the historical average ratio, probably in the region of between 1.5 and 2.

Another way of determining the degree of capital intensiveness of an industry is to calculate the capital/labour ratio. This is usually expressed in terms of capital invested per person employed or per worker directly engaged in production. The fixed capital at cost per employee as well as per worker directoy engaged in production is more than twice as high at Athi River than it is at the Bamburi plant, the absolute values being about £ 10,300 to 4,500 and 12,500 £ to 5,000 £, respectively. This may be again partly due to the fact that the Athi River factory has been working below capacity of its physical assets and by enlarging its production to the maximum capacity level would employ more labour, but not more capital, in this way reducing the amount of fixed capital per head of its labour force. But even under the assumption of it working close to full capacity its labour force would hardly have to be increased by more than 50 persons bringing the total to about 280 and the per-capita /investment remaining still over 8000 £.

Let us now turn to the degree of labour utilization in the two Kenya cement factories and compare it with figures of other countries.

The efficiency of labour is usually expressed in terms of man-hours per unit of output (table V). A comparison between different countries shows that especially the Bamburi plant has a productivity not much lower than in cement industries of economically more advanced countries and higher than in the Soviet Union. The productivity of labour of the Athi River plant is between 30 and 40% of the figure in some of the European countries. With only 12% of the total labour force, the portion of the administrative staff is extremely low at Bamburi.

Table V: Average Preductivity of Labour in the Cement Industry of Selected Countries

(in man-hours per unit of output unless otherwise stated)

| Country | Year | Preduction and Related Workers | Administrative and Clerical Staff | Total | Share of Production & Related Workers as % of total |
|---|---|---|---|---|---|
| France | 1960 | 1.83 | 0.50 | 2.33 | 77 |
| Germany (Fed. Rep.) | 1960[a)] | 1.76 | 0.34 | 2.10 | 84 |
| India[b)] | 1956 | 11.00 | 1.90 | 12.90 | 85 |
| Italy | 1960 | 2.02 | 0.36 | 2.38 | 85 |
| Switzerland | 1960 | 1.34 | 0.25 | 1.59 | 84 |
| U.S.S.R. | 1960 | 2.86 | 0.50 | 3.36 | 85 |
| U.S.A. | 1960 | 1.25 | 0.28 | 1.53 | 82 |
| Kenya Mamburi[c)] | 1965 | 2.94 | 0.39 | 3.33 | 88 |
| Athi River[c)] | 1965 | 4.89 | 1.04 | 5.93 | 83 |

a) Based on December employment.

b) Excludes quarrying and includes contract labour. The source calls the data "not comparable with other countries".

c) Assumed is that each worker works 2210 hours per year and that the Companies produced 406,000 tons and 85,000 tons of cement, respectively.

Source: United Nations, Studies in Economics of Industry, op.cit., p.6. for Kenya own calculations.

This way of measuring the physical productivity of labour by using physical units of labour inputs is not quite satisfactory for purposes of comparisons between countries in different stages of economic development because variations of labour costs are not taken into account. In order to get a better indication about the efficiency of labour utilization the diverging prices of the factor labour in different countries should be included. Table VI gives a rough estimate of the cash-labour costs per ton of cement in different countries.

Table VI shows clearly that the lower productivity of labour - expressed in man-hours per unit of output - does not automatically imply higher labour cost per unit of output. The contrary is the case. Bamburi demonstrates a lower total for its labour cost per unit of output than even the most efficiently working European firms. Also the difference of the Athi River plant to European factories is smaller than in table V. Labour costs per unit of output are still relatively high due to the high incidence of the expensive staff proportion. This is easily to be explained if we consider that the number of staff members is usually not fluctuating with output within a certain capacity so that Athi River, working at full capacity, would certainly have a much lower staff-cost/output ratio and probably also a lower workers' - wages/output ratio.

It has been stated above that the fixed capital requirements of small cement plants are relatively higher than of large plants. Consequently, the capital costs - depreciation, interest and the cost for repairs and maintenance - per unit of output are higher in smaller plants. The same is true for wages and salaries. Labour cost per ton of cement in a 400,000 t plant are less than half of what they are in a 100,000 t plant[1)], under ceteris paribus conditions. We can, therefore, conclude that the differences in labour cost per ton of cement between the two Kenya factories are more the result of differences in size and utilized capacity than of other factors.

An analysis of the labour force of the Kenya Cement Industry as to training and experience shows that very little differences exist in this respect between the two factories. Between 45 and 50% of the total labour force in both factories is classified as unskilled, the remainder being semiskilled and skilled including the management staff. Comparative figures for other developing countries show a higher portion of unskilled workers in the region of 60% of the total labour force[1]. This discrepancy may be due to differences in definition. A better indication about the necessary training and experience in the cement industry than the above classification and one which is not influenced by often inscidental results of labour negotiations is given by a racial breakdown of the labour force. The total labour force in the Kenya Cement Industry in 1965 was made up to 80 to 85% of Africans
and to 15 to 20% of Asians and Europeans.

If we accept the assumption that skilled and highly skilled Africans are still the exception rather than the rule[2] we can say that about 15 to 20% of the labour force in the Kenya Cement Industry belongs in the category of skilled and highly skilled personnel and management.

Future Prospects

The discussion of the sales of Kenya cement has shown that the future development of the industry will be strongly influenced by the foreign demand for its products. The domestic market will not grow fast enough in the next five years to take an appreciably larger share of total production than in the past.

Table VI: Cash-labour Cost per ton on Cement in selected countries (in shs)

| Country | Cash-labour cost per ton of cement | | |
|---|---|---|---|
| | Worker | Staff | total |
| Switzerland | 10/70 | 2/50 | 13/20 |
| Germany (Fed. Rep.) | 14/10 | 3/40 | 17/50 |
| U.S.A. | 22/50 | 6/45 | 28/95 |
| Kenya Bamburi | 7/05 | 5/60 | 12/65 |
| Athi River | 11/75 | 14/85 | 26/60 |

Sources: International Labour Office, Yearbook of Labour Statistics 1965, Geneva 1966; own calculations for the Kenya plants. For conversion ratios (man-hours per ton of cement) turn to table V.

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1) United Nations, op.cit., p.20, table 1 - 16

2) This assumption is realistic for the time being only. The situation will change as soon as more skilled and highly skilled Africans are available on the labour market.

The per-capita consumption of cement in Kenya as well as in Africa as a whole is still extremely low. Cross-country analyses undertaken by the E.C.A.[1] suggest that cement consumption is correlated with per-capita incomes and the size of the population and that the elasticity of demand for cement with respect to income in Kenya between 1961/63 and 1970 will fall from 2.40 to 2.01. If we take the average per-capita consumption of the years 1961 to 1963 (13.7 kg per head) as starting point[2] we get the following "normal" consumption path for cement in Kenya (table VII):

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1) United Nations Economic and Social Council, Economic Commission for Africa, Conference on the Harminization of Industrial Development Programmes in East Africa, Lusaka, 27 September to 5 October 1965, The Cement and Allied Industries in the East African Sub-Region, pp.32 - 34.

According to the E.C.A. - report, the elasticity of demand for cement with respect to income changes with changes in per-capita incomes according to the formula

$$e = 126.5/x + 0.8$$

where e = elasticity, x = Gross Domestic Product in U.S.$, Consequently, we get for Kenya

| | | |
|---|---|---|
| in 1961/63 | e = 2.40 | (x = £ 28.2 = $ 78.96) |
| 1964 | e = 2.26 | (x = £ 30.9 = $ 86.52) |
| 1970 | e = 2.01 | (x = £ 37.4 = $104.72) |

2) During these years the boom in the building and construction industry of the late 1950's had ceased but had not yet turned into the crisis of the two following years. The situation in 1961 to 1963 can, therefore, be considered "normal" and suitable as starting point for projections

Table VII: "Normal" Consumption Path of Cement in Kenya Between 1961/63 and 1970[1]

| Year | elasticity of demand e | real p.c. GDP(1964 prices ) (£) | "normal" p.c. cons. (kg) | population at mid-year (1000) | "normal" domestic consumption of cement (1000 metric tons)[2] |
|---|---|---|---|---|---|
| 1961/ 1963 | 2.40 | 28.2 | 13.7 | 8598 | 118 |
| 1964 | 2.26 | 30.9 | 16.8 | 9104 | 153 |
| 1965 | 2.22 | 31.9 | 18.0 | 9365 | 169 |
| 1966 | 2.17 | 32.9 | 19.3 | 9643 | 186 |
| 1967 | 2.13 | 34.0 | 20.6 | 9932 | 205 |
| 1968 | 2.09 | 35.1 | 22.0 | 10230 | 225 |
| 1969 | 2.05 | 36.2 | 23.5 | 10537 | 248 |
| 1970 | . | 37.4 | 25.0 | 10853 | 271 |

1) Assumptions and Sources:
1. Elasticity of demand for cement with respect to income according to ECA-formula
2. Per-capita incomes up to 1964 achieved values, later rate of growth of 3.2% p.a. according to Revised Development Plan.
3. Average per-capita consumption of cement between 1961 and 1963 (13.7 kg) as starting point.
4. Population figures until 1966: Statistical Abstract 1966, p.9. After 1966 rate of growth of 3% p.a. according to Revised Development Plan.

2) 1 metric ton = 0.9842 ton

Cement consumption is only indirectly connected to per-capita incomes and population number. There exists a closer correlation between cement consumption and capital formation and here especially with investment in buildings and construction so that an alternative method of calculating the prospective cement demand will be attempted.

The Revised Development Plan envisages an average annual gross investment in buildings and construction during the Plan period of 37.05 million £ against a level of 15.11 million £ in 1964[1]. The cement consumption in Kenya in 1964 was 82,700 tons which means that for each ton of cement sold investments in building and construction in the order of £ 182.7 were carried out. If we assume that this ratio will not change much until the end of this decade[2] we get an average cement consumption of 203,000 t p.a. during the plan period. On the basis of the projected sectoral distribution of capital formation

1) Republic of Kenya, Development Plan for the Period 1965/66 to 1969/70, Government Printer, Nairobi 1966. p.113

2) This assumption includes probably a slight downward bias because we can expect cement to become more "popular" as a building material in the future.

during the plan period we can derive the consumption path for cement in Kenya (table VIII). These figures are very close to those of table VII based on the ECA estimates.

According to both sets of estimates the consumption of cement in Kenya will rise until 1970 to about 260,000 to 270,000 tons. This is an increase of about 75% over the "normal" level in 1964 of table VII and an increase of about 225% over the real 1964 level.

The present capacity of the Kenya cement factories is 520,000 t per annum. The Bamburi Cement Company is currently engaged in an expansion programme which will bring its total capacity from 400,000 t p.a. to 700,000 p.a. by 1968. The total capacity of both the Kenya cement factories by 1969 will then be 820,000 t p.a. This means that in 1969 there will be a surplus capacity of about 570,000 t and in 1970 of about 560,000 t for exports. Exports in 1965 were of the order of 380,000 tons over 45% of which went to Tanganyika. With the new plant at Dar Es Salaam it can be expected that this market will be lost for the Kenya producers before the end of this decade.

Table VIII: Consumption Path of Cement in Kenya on the Basis of Projected Gross Fixed Capital Formation During the Years 1965/66 and 1969/70[1)]

| Item | 1965/66 £ mill. | 1966/67 £ mill. | 1967/68 £ mill. | 1968/69 £ mill. | 1969/70 £ mill. |
|---|---|---|---|---|---|
| I. Projected Gros Capital Formation, tot. | 42.0 | 63.3 | 66.1 | 71.8 | 81.1 |
| in: Agriculture & Lifest. | 6.5 | 10.2 | 9.9 | 9.9 | 11.6 |
| Non-Agric. Private Investment | 19.2 | 30.2 | 32.4 | 35.5 | 40.0 |
| E.A.C.S.O. | 5.0 | 6.1 | 3.4 | 3.3 | 5.0 |
| Other Public Inv't | 11.3 | 16.8 | 20.4 | 23.1 | 24.5 |
| II. Projected Gross Inv't in Building & Constr., total | 23.4 | 35.2 | 38.0 | 41.6 | 46.4 |
| in: Agric. & Lifestock (60% of total)[2)] | 3.9 | 6.1 | 5.9 | 5.9 | 7.0 |
| Non-Agric. Private Investment (42.5% of total)[2)] | 8.2 | 12.8 | 13.8 | 15.1 | 17.0 |
| E.A.C.S.O. (36.6% of total)[2)] | 1.8 | 2.2 | 1.2 | 1.2 | 1.8 |
| Other Public Inv't | 9.5 | 14.1 | 17.1 | 19.4 | 20.6 |
| III. Cement Consumption | 1000 t | 1000 t | 1000 t | 1000 t | 1000 t |
| (Divisor 182.7) | 128 | 198 | 208 | 228 | 254 |

1) Parts I. and II. of the table are preparatory in the sense that they serve to calculate the annual projected gross investment in building and construction. The figures under I. are, after rearranging them, taken over from table 11 of the Plan. The figures under II are derived from the annual averages during the Plan period of column 1 of table 10 of the Plan. It was necessary to go back to this sectoral breakdown because the estimated expenditures for building and construction are only given as annual averages and not for each year of the Plan period. The percentages under part II. are calculated on the basis of these averages and are assumed to remain constant in each year.

2) "of total" means of total projected gross investment in this sector.

Source: Development Plan 1966-1970, pp.113-114

By then, if the Kenya plants are to work at full capacity, new export markets outside East Africa for a surplus of about 350,000 t will have to be found, and about two thirds of total production will have to be exported, which is about the same export ratio as during the years 1961 to 1963 but lower than in 1964 and 1965. Whether or not this high rate of exports can be achieved depends on the development of demand for cement and the economic policies in the major export markets outside East Africa questions to examine is outside the scope of this paper.