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INDUSTRIAL EXCESS CAPACITY AND ITS UTILIZATION FOR EXPORT

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In the course of economic development and industrialization developing countries often are confronted with an unexpected phenomenon -- the impossibility of fully utilizing the productive capacity of their newly built industrial enterprises. Every developing country with a more or less significant programme of industrialization complains of excess capacity and seeks assistance in eliminating it. In certain developing countries, under-utilization of industrial capacity is becoming a major barrier to the entire process of further industrialization and, at the same time, threatens to make industrialization harmful to the economy. Without due regard to the possibilities of full or at least economically sufficient utilization of manufacturing capacity, the industrialization of developing countries obviously cannot proceed normally.

Due to the specific conditions of the present economic position of developing countries, the problem of excess capacity (very different from the problem of excess capacity in major developed countries, especially in the United States) is primarily related to external economic rather than to pure domestic matters. The material elements constituting the process of industrialization of developing countries -- beginning with capital equipment, financial resources, very often essential raw materials, spare parts and auxiliary supplies -- come to developing countries from abroad. Correspondingly, the export trade becomes an integral part of the entire process both because it is the only major way of paying for imported industrialization materials and because it provides an important outlet for the goods manufactured by the new industries.

In the United States, the problem of excess capacity, which recently has received great attention from American economists and public bodies, is a problem of American internal economy, connected with indigenous production of equipment, major raw materials, domestic market, labour supply and the general economic equilibrium of the country. This complex in which export trade plays a comparatively smaller role, is being studied by corresponding institutions as one of the primary domestic economic problems of the country.

For developing countries, this approach is invalid. Though domestic economic conditions are of great importance, capacity utilisation in developing countries cannot be dealt with unless the problems of external economic

relations, which are so necessary for understanding the causes of excess capacity as well as for suggesting remedies for reducing or eliminating it are taken into account. For this reason, the problem of excess capacity in developing countries is being studied by the export industries section of UNIDO. The aim of the present study is to find a way of utilizing industrial excess capacity for export.

Despite the absence of reliable statistics on industrial capacity and its rate of utilization, and despite the lack of special comprehensive studies, the importance of this problem for developed countries was well recognized. For developing countries, however, the problems of excess capacity, until very recently, were considered non-existent. It was thought that, while experiencing deficiencies in all kinds of fixed assets of productive capacity in all industries, the developing countries could not suffer from the same ailment as industrially developed countries, inclined to the tragedy of waste. In the course of the past few years, however, both economic theory and practice related to the industrialization of developing countries have advanced the problem of excess capacity as one of the major economic problems of developing countries, hindering their growth and creating a tendency toward economic stagnation. Excess capacity implies a certain waste of investment capital, which is frozen in an unproductive capacity rather than being used more effectively elsewhere. Excess capacity not only creates a burden to the national economy but is a waste of capital, causing loss of efficiency and cost increase. In several developing countries under-utilization of industrial capacity already has become a serious economic problem. For example, a study of the Indian National Council of Applied Economic Research states that the continuing serious under-utilization of industrial productive capacity, built up partly with foreign aid, has been a matter of deep concern to the Government and public. This under-utilization has resulted in a waste of scarce resources which India, with its shortage of capital, cannot afford. It also has increased the chronic inflationary pressures on the economy. Better utilization of the existing capacity and satisfactory agricultural production helped to maintain price levels during the first five-year plan. During the second and third five-year plan periods, however, poorer utilization of existing capacity was largely responsible for the less satisfactory price situation.

Although the scope of under-utilized capacity is much less in developing than in developed countries, the problem exerts a much stronger unfavourable influence on the economic balance of the former. The danger of further increase of the scope of under-utilized capacity is becoming more acute with the rapid development of industrialization in the developing countries. In developed and developing countries alike, the major factor leading to the inability to utilize fully all industrial capacity is the inadequacy of the market capacity to the production possibilities. In developing countries, the discrepancy between the market size and the production possibilities of the equipment is much more pronounced due to the fact that these countries are obliged to apply imported techniques and methods - developed and refined in the modern large markets of the United States and Western Europe - to their own small, often embryonic, markets.

The question of excess (under-utilized) capacity is not regarded by economists as a problem similar to that of chronic unemployment. Even in rich and industrially developed countries, excess capacity causes losses to the economy and impairs economic equilibrium. In certain periods an increase in the rate of excess capacity may result in an economic crisis and may, sometimes lead to big losses for industrial companies and even to their bankruptcy. The problem of capacity utilization in developed countries, though different in nature and cause from that in developing countries, should also be studied to clarify many aspects of the possibilities of utilizing excess capacity in developing countries for a short.

✓ A. Phillips, "Industrial Capacity - An appraisal of Measures of Capacity", *American Economic Review*, Vol. 53, 1963, p. 275: "Both the number of unemployed and the volume of excess capacity indicate the extent to which society is failing to use... its full capacity".

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The following order has been chosen for the presentation of the problem in the present paper:

- First, some statistical data are given to afford a general appreciation of the significance of the capacity under-utilization in developing countries, if such information is available
- Second, a brief account of the unfavourable effects of capacity under-utilization for the industrialization of developing countries is put forward.
- Third, an analysis of the main causes for capacity under-utilization is given, seeking ways to eliminate or at least reduce it.
- Finally, some recommendations are drawn up and further steps for dealing with this problem are suggested. Special emphasis is laid on the statistical problems connected with the measurement of capacity and the evaluation of the actual rate of capacity utilization.

I. RATE OF CAPACITY UTILIZATION IN SELECTED COUNTRIES

Information on capacity utilization in manufacturing industries is very scarce and fragmentary. Even when this information is available, it is not always reliable, though in many cases the rate of capacity utilization is reported with great accuracy - including tenths of per cent. More difficult is the problem of the comparison of this information which is derived from different sources and related to different countries. Despite all this, it is clear that, without additional capital investment, present industrial equipment is capable of producing much more manufactured goods, a good part of which could be exported.

The first part of this section deals with capacity utilization in India, which is by far the biggest developing country next to China (which constitutes a case by itself) with a comparatively large rapidly growing industry. The second part of this section presents statistics of capacity utilization in Latin American countries. All information given here was taken from published sources or from communications of various economic institutions to the UNIDO. The source material was assumed to be reliable; no corrections or verifications were made.

India

No comprehensive statistics on capacity utilization in developing countries are available. Even in India, where this problem receives serious attention from official governmental and planning bodies, only rough estimates exist. Uncertain data are published occasionally in different documents and studies and very often the estimates contained in these studies differ widely. The Report of the Import-Export Committee of the Government of India (1960/1961), for example, took the view that the extent of under-utilization of industrial capacity was from 15 to 20 per cent. The chemical, cement and sugar industries were running on full-time, round-the-clock production and the majority of cotton textile mills ran in multi-shifts. The shortfall, according to this report, was only in the field of engineering industry, but the report optimistically pointed out that even this sector was improving. Another study, brought out at the same time by a different governmental organization - the Central Statistical Organization - indicated on the contrary that only in 110 of 215 selected industries did the utilization of capacity exceed 75 per cent. Among the remaining 105 industries the proportion of utilization ranged from 65 to 75 per cent in 33 industries, and below 35 per cent in 72 industries; among the latter there were even cases of utilized capacity being less than 20 per cent.

In the autumn of 1966, the Indian National Council of Applied Economic Research published a special study of capacity under-utilization in Indian industry. Although 4,728 questionnaires were sent out to manufacturing units in 17 industry groups covering 276 industries only 129 replies were received; these served as a partial basis of the report. Out of the total of 276 industries only 140 have been covered by the various group indices of under-utilization. The results of the estimated under-utilization of industrial capacity in India during the years 1955-1964 are presented in the following table:

Table 1 Overall under-utilization of industrial capacity
(Percentage)

1955 - 13.3	1960 - 11.8
1956 - 11.0	1961 - 10.9
1957 - 10.8	1962 - 9.4
1958 - 15.2	1963 - 11.0
1959 - 13.6	1964 - 10.5

These figures show the average capacity under-utilization on an annual basis taking into account capacity estimates as officially reported and based on the number of actual shifts worked (single shift for 102 of the 140 industries covered, double shift for 6, and three shifts for 32 industries with continuous production processes). This study, however, did not take into account the productive potential which could have been tapped if multiple shift working could have been adopted more generally. The index of capacity under-utilization conceals also a considerable disparity in capacity utilization between industries. The case of basic metals is cited by the study as an informative example. In the iron and steel group, the under-utilization varies from 0.1 to 16.3 per cent, in the non-ferrous metal group it ranges from 16.9 to 39.6 per cent; when both groups are taken together, the range of under-utilization is from 3.3 to 17.8 per cent. When industries are taken separately, a much greater degree of capacity under-utilization is revealed. Four major industrial groups have over 20 per cent of their capacity unutilized, and in some years unused capacity is as high as 40 to 50 per cent.

When calculations of the extent of under-utilization are made with reference to multiple shift working, which the Perspective Planning Division considered desirable, they result in a much greater percentage of under-utilization. On the basis of feasibility and techniques of production, the Perspective Planning Division suggested multiple shift working for about 112 industries, 3-shift for 33, and double shift for the remaining 79. If all the proposed multi-shift working industries, including some not mentioned by the Perspective Planning Division, are taken into account the rate of under-utilization for the years 1961-1964 would be as follows:

Table 2 Overall under-utilization of capacity
(Percentage)

Year	On present working schedules	On proposed working schedules
1961	10.9	18.6
1962	9.4	17.8
1963	11.0	19.3
1964	10.5	17.7

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But even these figures (about 18 to 19 per cent of capacity under-utilization for all Indian manu. const. industries) do not show the real significance of the problem. These average figures conceal a greater rate of under-utilization of many important industries. Three major industries (textile products, basic metals and food products), contributing 67.5 per cent of the total value added by manufacturing, enjoy a comparatively higher rate of capacity utilization and work on a broader multi-shift basis than other industries. Their heavy weight in the statistics makes the overall average index of under-utilization rather modest, though for many industries of primary importance for industrialization and economic development the problem of capacity under-utilization is of the utmost significance.

The following table contains data on capacity under-utilization in other than the above-mentioned three industries:

Table 3. Approximate rate of capacity under-utilization in selected industries
(Percentage)

Industry group	Range of under-utilization on present working schedule (1955-1964)	Average under-utilization on proposed multi-shift working (1961-1964)
Leather and leather products	20-50	57
Chemicals and chemical products	10-35	56
Non-metallic mineral products	20-22	35
Metal products	20-40	56
Machinery (except electrical machines)	10-30	31
Electrical machinery and appliances	10-20	43
Transport equipment	10-33	42

In a serious study on the role of export in Indian economic development, the Indian economist R.K. Singh - at present secretary of the Engineering Export Promotion Council - gave his estimates of capacity utilization in Indian industry in 1961. At that time 18 engineering industries were utilizing less

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than 50 per cent of their capacity (showing varying degrees of idle capacity from 98 per cent in the case of arsenical copper rods to 30 per cent in the case of wire ropes), 14 industries had a capacity utilization of between 50 and 75 per cent (with 50 per cent of idle capacity in the case of railway wagons and 25 per cent in the case of coated abrasives - both these industries having export potential), 15 industries had a capacity utilization of between 75 and 100 per cent. In his book Prosperity through Export, Singh considers that "the existence of a high percentage of idle capacity is a serious problem before the engineering industries" (p.39).

The under-utilization of productive capacity in the Indian chemical and chemical products industry is also quite substantial. Other industries which also could make some contribution to export are working below their capacity.

According to Singh's study, of the 25 industries connected with the manufacture of rubber products, 17 have a high utilization of capacity (above 75 per cent), but their production can be increased if they work more than one or two shifts (excepting those which are already working three shifts). Four industries belonging to this group work from 75 to 65 per cent and even below 65 per cent of their capacity. Many of the industries have export potential and even increased production, they would be in a position to export.

Of 63 industries belonging to the chemical and pharmaceutical branch, 27 have a capacity utilization of above 75 per cent, 17 have between 74 and 50 per cent, and the remaining 19 work below 50 per cent of their capacity. It is important to note that the installed capacity is based in most cases on single shift work.

At the beginning of 1967, the Industrial Credit and Investment Corporation of India (ICICI) made an estimation of surplus capacity in Indian industry together with comparative Indian and world prices. The results of this estimation of surplus capacity for the year 1965/66 and for the future (1970/71) are systemized in Table 4.

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Table 4 is meant to give an idea of the industries in which either substantial idle capacity exists or in which the anticipated volume of production is expected to be in excess of the likely demand by 1970/71. In the compilation of this table, data on the present installed capacity and output were obtained from official published sources; present and anticipated demand are based primarily on ICICI studies except in those cases where Government estimates have been made (indicated in the table). Additional capacity likely to materialize by 1970/71 has been taken from ICICI studies and from data published by the Industries Ministry, and includes only that part of the capacity for which firm foreign exchange commitments have been made.

Industries included in Table 4 represent broadly three types: the first category (steel castings, cast iron pipes, wire ropes, diesel engines [stationary], welding electrodes, etc.) represents items where surplus capacity already exists; the second category (steel forgings, electro-motors, ball and roller bearings, domestic refrigerators, room air conditioners, etc.) includes items where a surplus situation is expected to develop in the course of a few years; and the third category (house service meters, wire ropes, particle boards, etc.) includes those items whose present output is deliberately curtailed to keep in step with domestic demand. Mention must be made of the machine-tool industry, where due to the heterogeneity of products it is impossible to qualify production, capacity and demand data. It is known, however, that this industry has a large unutilized capacity at present and is expected to carry significant surplus capacity for some time. The items which may be considered as readily exportable include centre lathes, milling machines, gear shapers, glass hoppers, horizontal boring machines, planing machines, power presses, etc. Also included in this list are items of which there has been a glut on the internal market, e.g. wired glass or chemical products such as EHC formulations, copper, chloride, zinc phosphide, or paper items such as tissue, stencil and carbon papers.

In a personal letter Singh sent us the following data on capacity utilization in Indian engineering industries for the years 1955, 1960 and 1965. It is evident that acute under-utilization has been a permanent malady of certain industries during the ten-year period of study.

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Table 4. Output, installed capacity and demand - Present and anticipated for selected industries

Industry	Unit	Installed capacity (1965/66)	Output (1965/66)	Demand (1965/66)	Additional capacity likely to materialize by 1970/71	Total anticipated capacity by 1970/71	Anticipated demand by 1970/71
Steel castings	(000 tons)	123	61	60	204	327	275
Steel forgings	"	83	65	75	106	192	120
Cast iron pipes	"	309	220	225	325	634	650*
Steel pipes and tubes	"	361	258	260	413	744	600
Wire ropes	"	28	18	16	12	40	30
Electric motors	(Dsc Hp)	22.35	17.02	20.00	7.55	29.94	35.0
Diesel engines (stationary)	(000 nos.)	70	85	66	6	76	200
Power-driven pumps	"	185	202	200	5	190	400*
Ball and roller bearings	(Mill nos.)	12	9	12	9	21	30
Welding electrodes	(Mill a.ft.)	1093	703	1060	797	1890	1850
Domestic refrigerators	(000 nos.)	36	30	30	18	54	55
Room air conditioners	"	20	11	20	19	39	35
House service meters	(Lac nos.)	13	11	11	5	18	15
Particle boards	(000 tons)	25	12	10	129	154	-
Aluminium cables and wires	(000 tons)	53.5	61.3	100	60	113.5	330*
(VIN & PVC)	(Mill core yds.)	1011	450	850	86	1097	1000
Hand tools	(tons)	1220	1200	5000	7000	8220	10000
Tyres	(000 nos.)	30700	20476	20600	1783	32483	54000
Railway wagons	(nos.)	32734	24427	-	1000	33734	-
Pistons	(000 nos.)	1600	1075	1500	300	1900	2700
Brake linings	(tons)	2150	1330	1435	1130	3580	2600

* Demand estimated by the Indian Government

Table 5 Under-utilization of capacity in Indian engineering industries

Industry/product	Production as per cent of capacity		
	1955	1960	1965
(a) Acute cases of under-utilization of capacity (i.e. below 50%)			
Bandsaw blades	7.7	32.9	23.2
Expanded metal	79.1	35.2	24.6
Bare copper conductors	30.3	55.2	24.6
Locks (colico, semi-automatic and automatic)	54.9	52.6	36.2
Stoves	47.2	97.3	48.2
(b) Cases of substantial under-utilization of capacity (i.e. 50-75%)			
Thermoflasks	31.2	41.5	53.8
Duplicators	33.5	56.0	54.5
Tungsten carbide (sintered)	-	74.4	56.8
Air conditioners	-	52.3	56.8
Wire ropes*	-	51.3	58.9
Rubber and plastic insulated cables and flexibles	99.2	87.4	60.7
Oil pressure lamps	62.8	91.7	61.8
Hacksaw blades	8.5	30.9	62.0
Typewriters	28.1	52.3	62.3
Conduit pipes	94.1	153.3	63.2
Steel castings	100.1	83.5	67.4
Aluminium conductors	77.6	117.4	70.4
Paper insulated power cables	-	147.5	70.9
Ball bearings	134.4	188.8	71.3
Wire rods	-	139.1	71.6
Sewing machine needles	-	26.3	72.7
(c) Cases of moderate under-utilization of capacity (i.e. 75% and above)			
Road rollers	-	94.1	75.2
Lazor blades	42.1	89.8	75.2
Arc welding electrodes*	125.8	84.5	75.4
Machine tools	-	140.1	76.2
Machine screws	145.3	87.5	79.0
Winding wires	136.8	96.1	82.4
Lathe tools (tool bits)	-	115.4	84.3
Hurricane lanterns	109.7	113.1	85.9

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Table 5 (contd.)

Industry/product	Production as per cent of capacity		
	1955	1960	1965
Grinding wheels	64.2	66.4	85.9
Steel files	15.6	66.3	87.2
Fluorescent lamp	108.5	127.2	92.8
House service meters	128.3	125.1	95.0
Million cutters	36.7	105.4	95.3
Electric fans	92.9	116.8	95.3
Plastic accessories, electric wiring	-	-	95.0
Sewing machines	244.5	220.3	95.4
Enamelware	52.4	47.2	96.3
Diesel engines, vehicular type	129.2	176.2	96.4
Miniature lamps	-	-	99.4

Source: R.K. Singh

- * Capacity has been assessed on a double-shift basis (all others are based on single shift).
- Denotes nil/not available.

Current statistics on capacity and production in Indian industry reflect the same situation with regard to capacity utilization. The rate of capacity utilization fluctuates from year to year and from one period to another within the year. This is not only because of changes in production, but also because the capacity estimations fluctuate. It is usually expected that the trend of capacity installed in developing countries be upward, but in the case of some Indian industries the capacity (at least capacity estimations reported by the official statistical authority) fluctuates upward and downward like production.

Capacity estimates fluctuate from year to year. In certain industries reported capacity can be significantly smaller one year than in the previous year without obvious change in the real volume of the fixed assets. This is illustrated in the following table.

Table 6 India, manufacture of transport equipment:
estimated monthly installed production capacity of trailers (nos.)

1954	541	1965 January	762
1955	541	February	762
1956	591	March	762
1957	860	April	762
1958	535	May	762
1959	650	June	762
1960	645	July	762
1961	945	August	762
1962	655	September	526
1963	672	October	526
1964	672	November	526
		December	526

In January 1965, installed capacity was reported as 762 trailers per month; in September of the same year the estimation was drastically reduced to 526 though actual production in this month (668) exceeded the reported monthly capacity by more than 25 per cent.

It is not easy to say whether these fluctuations are the results of pure statistical operations, or whether they reflect actual changes in the volume and size of installed capital equipment. As statistical methods of estimating capacity improve, it is inevitable that other methods will be adopted which will give other results even if they are applied to the same material. The director of the Central Statistical Organization, K.L. Saxena, informed us that it has recently been decided to express the capacities of industries along the basis of annual maximum utilization of plant and machinery. The concerned agencies responsible for the development of industries are taking steps to re-assess the capacities on this revised basis. From now on the official estimations of capacity will be different from those made previously, even when there is no change in the physical volume of the equipment. Comparisons with earlier years will be even more difficult to make.

As far as fluctuations of output are concerned, their influence on the rate of capacity is very important in certain industries. Without taking into consideration those industries with vast variations of production (food processing, etc.), it is easy to discover many examples of drastically fluctuating output levels during the year. The production of hand saw blades in India in 1965 may serve to illustrate this point.

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With an installed monthly capacity of 180,500 running metres of bandaw blades in January 1965, the actual monthly production was:

<u>Month</u>	<u>Actual production</u> <u>(running metres)</u>	<u>Capacity utilization</u> <u>(percentage)</u>
January	28,878	16
February	15,141	8
March	21,830	12
April	21,789	12
May	19,679	11
June	36,414	20
July	89,781	49
August	80,192	45
September	19,260	11
October	17,558	10
November	107,785	60

With great fluctuations in production throughout the year (15,000 metres in January and 108,000 in November) the rate of capacity utilization changed very drastically. In January only about 8 per cent of capacity was utilized, in November 60 per cent.

The same situation can be observed also in other Indian industries. Although production is not seasonal great fluctuation in the rate of capacity utilization throughout the year is particularly evident in the plasticizer industry. With a capacity of 233.3 tons per month at the end of 1964, the production of plasticizers and capacity utilization in this industry in 1965 was:

<u>Month</u>	<u>Production</u> <u>(tons)</u>	<u>Capacity utilization</u> <u>(percentage)</u>
January	94.9	41
February	83.4	37
March	100.0	43
April	296.1	127
May	298.4	124
June	286.8	127
July	298.8	91
August	212.5	86
September	199.0	28
October	64.6	81
November	188.1	67
December	157.8	

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With the reported average monthly capacity of 672 trailers in 1963, actual monthly production was:

<u>Year</u>	<u>Production</u> (nos.)	<u>Capacity utilization</u> (percentage)
1963	282	42
1964	566	86
1964 December	136	24
1965 January	1,046	168

Under-utilization of capacity in the engineering industry of India is due in part to the shortage of the main raw material - steel. At the same time, however, the iron and steel industry of India is not utilizing its capacity either; according to the information of the National Metallurgical Laboratory of India, under-utilization will continue in the iron and steel industry until at least 1970/71. Installed capacity and actual production of main metals and heavy equipment are reported by this Laboratory as follows:

	1965/66			1970/71		
	Capacity	Pro- duction	Capacity Utilization (percentage)	Capacity	Pro- duction	Capacity Utilization (percentage)
Iron and steel:						
a) Steel ingots	8,900	7,100	79	14,600	13,000	89
b) Finished steel	6,600	5,300	80.	11,000	10,000	92
c) Pig iron for sale	1,200	1,200	100 .	3,200	3,200	100
Alloy, tool and stain- less steel	50	35	70	500	400	80
Aluminium	73	80	109	263	260	99
Machinery:						
Metallurgical and other equipment	30	15	50	100	60	60
Steel casting	170	60	35	300	250	84
Coal and other mining machinery	75	12.5	17	60	45	75

In the early part of 1967 a special mission from UNIDO studied the main factors affecting India's export expansion. The mission came to the conclusion that the machine-tool industry in India has been in a slump for two years, and is operating only at about 70 per cent of its capacity. The surplus manufacturing and engineering capacity could be utilized to design and build much new special purpose machinery that would be readily marketable. This industry apparently

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could sell its machines at substantially lower prices than the United States and Europe. To take advantage of this opportunity, India's machine tool industries must be given more overseas marketing and credit financing flexibility.

The problem of excess capacity is growing in importance with the progress of industrialization. It is especially acute in larger developing countries where new industries are being established on a relatively wide scale. India presents the most evident case for the necessity and urgency of the solution to this problem. The growing concern of the Indian Government and the increasing pressure of economists resulted in a special research project being undertaken by a group of experts with an aim to explore this problem in all of its ramifications. In the summer of 1965, a special joint study of the extent of utilization of Indian industry was launched by the Government of India in co-operation with the United States Agency for International Development.

This study was conducted in spite of the fact that India was the only country in the world which had officially published statistics of installed capacity. Nonetheless, many people in India believed that there was more potential capacity than that reflected in official statistics. Indeed, such a conclusion appears well founded if one studies the monthly production statistics of selected Indian industries in which the actual production figures of some goods are much higher than the installed capacity reported on the same page (e.g. with an officially published monthly installed capacity of 16 spinning frames in 1964 the actual production was reported as 32 spinning frames, i.e. double the estimated monthly average capacity; cf. p.117).

One of the aims of the study was to determine whether the data available to the Government of India in the Directorate General of Technical Development, was sufficiently valid to permit its use in calculating the extent of utilization of industrial plant in being and to determine the best method of improving the data available to the Directorate General of Technical Development if this was found necessary.

Results of the study confirm the fact that capacity "in being" differs from that officially recognized and published. In the case of welding electrodes the effective capacity, based on 2½ working shifts, of the plants studied appeared to

Table C. Manufacture of chemicals and chemical products.

Product	Unit	Period studied	Capacity	Production	Capacity utilisation (percentage)
Benzene	th. litres	1963	2,943	1,765	59
Acetylene	th. cubic metres	Aug. 1965	909.7	434.5	47
Acetic acid	th. kgs.	April 1965	1,123	422	38
Power alcohol	th. litres	1963	6,331	2,110	34
Rectified spirit	th. litres	July 1965	27,297	16,224	60
Acetic anhydride	tons	1963	304	285	94
Acetone	tons	1961	58	63	108
Ethyl acetate	tons	Jan. 1965	253	183	71
Yeast	tons	1964	74	33	45
Sulphuric acid	tons	Aug. 1965	90,192	45,060	50
Caustic soda	tons	Sept. 1965	22,384	17,946	82
Soda ash	tons	May 1965	27,483	24,968	93
Chlorine liquid	tons	Nov. 1965	5,532	4,232	76
Bleaching powder	tons	1962	1,080	560	55

Latin America

All countries of Latin America report heavy under-utilization of industrial capacity. In 1962 the degree of capacity utilization in Central American countries was:

Nicaragua	-	82 per cent
Guatemala	-	74 per cent
El Salvador	-	73 per cent
Costa Rica	-	72 per cent
Honduras	-	63 per cent

Surveys taken in Ecuador in 1959 and 1961 show that in this country only 41 per cent of the manufacturing capacity is utilized. In Argentina, different industries have a different degree of capacity utilization, but not one industry

utilizes more than 88 per cent of its capacity and some industries as little as 43 per cent (1961-1967). A paper presented for the ICLA Regional Symposium on industrialization states that it may be broadly concluded that installed capacity was not being fully utilized in most of the branches of Colombian industry.

A significant degree of under-utilization is reported in Chile. In 1957 large-scale industry in this country utilized 55.3 per cent of its theoretical maximum capacity, medium-scale industry - 33.1 per cent, small-scale industry - 50.3 per cent. These estimates differ, however, from the somewhat higher estimates made by the industrialists canvassed (which are not always in keeping with the maximum employment periods given). For the manufacturing industry as a whole, the official estimate of capacity utilization calculated as percentage of maximum theoretical capacity is 45.7 per cent as over against the estimate of the industrialists - 64.8 per cent. Maximum capacity in this case is maximum output during three eight-hour shifts in large-scale industry, two shifts in medium-scale industry and one shift in small-scale industry, with some exceptions where special working conditions determine the number of shifts.

In Venezuela, according to the estimates of COMDIFLAV, there are divisions in each major industrial group which use less than 50 per cent of their capacity, while other divisions use between 50 and 75 per cent. Among the industries utilizing less than 50 per cent of their capacity, the following have export potential: canned and shell-fish, chocolates and confectionery, fruit juices (food industry); knitted fabrics and rope (textile industry); wearing apparel (clothing industry); wooden furniture, special types of paper, fur, sulphuric acid, aluminium products, etc.

As in India, the average rate of capacity utilization in Latin American countries conceals a much higher degree of excess capacity in certain smaller branches and in some enterprises within a single branch. For example, the textile industry of Honduras in 1962 used 54 per cent of its capacity, but the rate of capacity utilization in textile enterprises having between 20 and 49 workers was only 9 per cent (larger units with more than 100 workers worked with a higher degree of capacity utilization, i.e. 78 per cent). With 74 per cent of capacity utilization for total industry in Guatemala (1962), the timber and cork

industry utilized only 59 per cent, the furniture industry - 53 per cent, and the metalworking industry - 62 per cent of capacity. These estimates, ~~made~~ on the basis of statements of industrialists, are somewhat different from the Central American Bank's official estimates of theoretical capacity.

Detailed information is available on production cost variation dependent upon capacity utilization for the food processing industry in Brazil in 1963. According to a study undertaken by the Instituto Brasileiro de Economic, the degree of capacity utilization varies greatly within a single industry. Whereas some enterprises work with full capacity utilization (100 per cent as reported by the enterprises) other enterprises use only 32 per cent of their capacity. A smaller enterprise in the meat canning industry reported only 10 per cent of capacity utilization.

In the case of the Brazilian food processing industry the dependence of capacity utilization on the size of the plant appears to be of certain interest. Although some enterprises reported 100 per cent capacity utilization, there were no large enterprises in the corresponding industrial group; usually they were middle-sized, sometimes smaller enterprises. The capacity utilization of larger plants is generally neither the lowest nor the highest within their industrial group. The highest degree of capacity utilization is reported by middle-sized (rarely smaller) enterprises. In the bakery and biscuit industry, larger enterprises (those with a capacity of 120,000 tons per year) utilized 70, 90 and 100 per cent of their capacity, smaller enterprises (2,000 tons per year) presented a somewhat mixed picture with capacity utilization of 44 and 90 per cent.

II. UNFAVOURABLE EFFECTS OF CAPACITY UNDER-UTILIZATION

In developing countries capacity under-utilization, which is partially the result of economic disequilibrium, aggravates the situation and makes the disequilibrium more intense. Under-utilization of industrial capacity endangers the very process of industrialization, and may cause industrialization to become detrimental rather than helpful to the solution of economic problems and to the furtherance of fast and progressive development.

Under-utilization of capacity in developing countries causes the investment-output ratio to rise and in so doing reduces the economic efficiency of production. As investments in developing countries have a very high import component, the import-output ratio in new industries is rising. These and other factors impede the general progress of industrialization.

Under-utilization of industrial capacity results in a fall of the profit rate and in losses of investment fund (both for gross investment and for net capital formation).

Under-utilization of capacity induces further concentration within the existing industries and acts as a strong deterrent against entry by outside firms, thus increasing the rigidity of the monopolistic structure and preventing its transformation by barring the introduction of more efficient techniques.

If a company or enterprise has a high rate of under-utilization of productive capacity, there are no incentives for introducing further technical innovations which demand additional investment for they promise to cause even greater under-utilization of capacity. On the other hand, if the utilization of installed capital equipment were more intense in developing than in developed countries (e.g. double- or triple-shift work with equipment usually used by one-shift in developed countries; or supplying, where it is economically justified, more labour to the unit of equipment) it would greatly contribute to economic development, industrialization and to the solution of economic, social and human problems.

Fuller utilization of plant capacity creates additional jobs and brings overall expansion into the economy of developing countries. It contributes to the growth of the market and to the increase of national income in other sectors.

Lack of capital and shortage of foreign exchange are the primary factors hindering the desirable process of industrialization in the developing countries. If existing fixed assets can be made to yield greater output, developing countries will be able to produce a larger total output, to facilitate the process of industrialization, to increase both national wealth and personal income and to improve the economic efficiency of their productive mechanism.

Better utilization of installed capacity would mean great gains for the economy of developing countries. The volume of industrial production would increase, and the rate of development would be much higher. The cost of production would be lower and competitive power of the product on the world market would be stronger. Employment would increase and incomes (including plant profits and workers' wages) would rise.

All this is well understood by the governments and business people of many developing countries. Economic plans often have special provisions for better plant utilization, though these provisions are formulated far too generally. They are seldom backed with appropriate financial, technical and organizational measures.

The second plan of Indian economic development drew special attention to the necessity of fuller utilization of the existing industrial capacities. It is a basic principle of planned development that capital resources which are scarce in relation to competing demands should be conserved and that additional production should be achieved to the maximum extent possible through greater use of idle capacity.

The cost structure of industrial products in developing countries makes an intensive use of plant facilities especially favourable as compared with developed countries. In most developing countries, capital is scarce as compared to manpower, and the price of equipment is unproportionately high in relation to the remuneration of the worker. Calculations made by Morris J. Solomon show the difference in the relative importance of machinery and manpower in terms of cost formation in India and the United States. He expresses the value of machinery as a monthly rental value and computes the ratio of this monthly value to the monthly remuneration of the operator. The results for a specific machine used both in India and the United States are startling as is shown in the following comparison.

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Monthly costs of a specific machine in India and the United States

Country	Monthly rental value (depreciation, interest and maintenance)	Monthly remuneration of operator	Ratio of rental value to operator remuneration
India	Rs 2,200	Rs 150	14.7
U.S.A.	\$ 465	\$ 300	1.6

Given the same efficiency per man in India and the United States the difference in cost structures would make it advantageous to have three men for two machines in India whereas such an arrangement would not be profitable in the United States. As the productivity per man is lower in India, the advantages of multi-shift operation becomes even more pronounced.

For developing countries, much more than for developed, full capacity utilization is a necessary prerequisite for any further expansion of capacity. In achieving full capacity utilization, exports must play a major role due to the specific dependence of the industrialization of developing countries on the outside world.

There are two main aspects to the problem of utilizing excess manufacturing capacity for export. Both of these aspects are very closely interrelated and therefore should be discussed together. One aspect is related to the various technical, economic, managerial and social difficulties which should be solved in order to achieve better utilization of installed capacity at each enterprise and in the industry as a whole. This aspect of the problem is very important and UNIDO can provide substantial assistance to the developing countries in finding ways of solving these difficulties. Studies in this field have been made both in developed and developing countries and can provide information which may be useful to other countries and industries. Certain difficulties can be eliminated through improvement in management, better planning and economic co-ordination as well as through additional investments which, in the frame of the existing market structure and pattern of demand, may be very small in comparison with the potential gains, including a better education of the population

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The second aspect is connected with the limits imposed upon production by market structure, pattern of demand and the restricted possibilities of selling additional output on the domestic or world market. This aspect is no less important than the first one, for economic and social difficulties are much more difficult to overcome without serious changes in both the socio-economic structure of the developing countries and in international economic arrangements. If no market exists for additional commodities produced through better utilization of capacity in developing countries, neither managerial and planning improvement nor the introduction of new methods will increase the rate of capacity utilisation. On the contrary, an increase in the productive potential may contribute to a yet greater under-utilization of capacity with all its casual consequences.

III. MAIN CAUSES OF EXCESS CAPACITY

Broadly speaking, there are three major causes for the existence of excess capacity: (1) in building ahead of demand the indivisibility of plant must always lead to a certain degree of temporary under-utilization of capacity; (2) an oligopolistic or monopolistic market structure, which leads to a production level below that of minimum average cost and less than physical capacity; (3) supply bottlenecks of various kinds. Some other causes are often met with in practice. (The obsolescence of certain lines of production represents a misinvestment and is different from excess capacity proper.)

All these causes are often found in combination and in practice are difficult to disentangle from one another, although analytically they are distinct. To a certain degree the first two causes of excess capacity are inevitable concomitants of growth; the first, because technology determines that the establishment of plants for a given increase of payment can proceed only by discontinuous jumps, and the second, because the transplantation of modern techniques to limited markets often has the result that only a small number of firms can be sustained by such a market. Because these two causes of under-utilization of capacity are largely technically determined, they cannot therefore be done away with; at best they may be mitigated by various policy measures.

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The third cause of excess capacity has to do with the unbalanced growth of various sectors in a developing economy and with balance of payment difficulties which create supply bottlenecks and thus reduce output below the level it could otherwise attain. In countries such as India, for example, this problem assumes major proportions. In fact, a recent study of the problem of capacity under-utilization^{2/} deals exclusively with these causes as the factors responsible for under-utilization. It states that the following causes are responsible for under-utilization (in so far as the respondent firms were concerned): (1) shortage of raw materials, (2) shortage of foreign exchange, and (3) labour troubles (i.e. shortage of skilled manpower). None of the firms which returned a questionnaire mentioned a lack of demand for the product or other market difficulties. But this does not mean that the market problem does not exist. Much depends upon the composition of the questionnaire sent to the firms and pre-occupation of people answering the questionnaire. The three causes stated in the study are easier to discern and hence easier to remedy. They could probably be dealt with through existing international aid facilities whereby such aid would have a multiple effect in the sense that the elimination of certain critical supply bottlenecks would increase output by far more than the usual capital-output ratio of foreign aid.

Among the supply bottlenecks which result in under-utilization of installed capacity, one must distinguish between those which involve investment and are therefore of a long-term nature (for example, insufficient supply of electric power which can be provided only by the establishment of new power plants) and those which relate to expendables and are essentially of a short-term nature (e.g. lack of critical raw materials of adequate quality).

It is very difficult to distinguish excess capacity, resulting from a malfunctioning of the economic mechanism, from the technically unavoidable excess capacity that always accompanies growth. But for the practical purpose of reducing excess capacity and utilizing the additional output for export, such a

^{2/} National Council of Applied Economic Research, Under-utilisation of Industrial Capacity, New Delhi, Oct. 1966.

distinction is necessary. Building ahead of demand when modern and effective equipment is not fully utilized can provide for a surplus of products which could be exported. An oligopolistic or monopolistic market structure, on the other hand, can prevent fuller utilization of capacity even when there is a local demand for the product, not to speak of the difficult and costly attempts to find export outlets. Supply bottlenecks present another problem.

In order to make a quantitative analysis of each of the main factors contributing to capacity under-utilization, it will be necessary to conduct special studies involving market research, cost analysis, company structure research, etc. At present, however, only various kinds of supply bottlenecks have been studied with relative thoroughness, and other causes of under-utilization are left for more comprehensive analyses in the future.

Only occasional remarks by persons conducting research studies are available regarding the market difficulties as important factors of capacity under-utilization. These remarks tend to support the conclusions reached by pure theoretical speculations on the limits and obstacles to the economic growth of developing countries in the present world economic structure. Thus, in a special report submitted by F.J. Glover to the United Nations Centre for Industrial Development in December 1965, limitation of market demand is stated as the first of a number of reasons for low capacity utilization in the Chilean manufacturing industry. In the opinion of R.K. Singh, a substantial part of under-utilization of capacity in the Indian manufacturing industry may be due to the dwindling market for the goods produced.

Shortage of raw materials and auxiliary supplies

Inadequate supply of raw materials and other inputs are important causes of under-utilization of capacity in many cases when the market demand could permit a higher rate of utilization. In several cases where the actual capacity is well in excess of market demand, the actual capacity utilization is even less than the market demand. A study on capacity utilization in the Indian tin containers manufacturing industry discovered that although installed capacity was in excess of demand, production was short of demand by the equivalent of some

15,000 tons of tinplate for 1964/65, according to estimates of the Metal Box Company. Other firms in this industry studied by the research group also were convinced that demand for all types of containers was well in excess of their ability to produce, due to restrictions on the availability of tinplate.

New manufacturing enterprises established in developing countries suffer from the shortage of raw materials either because there are no indigenous sources of these materials or because the indigenous sources are insufficiently developed. There are cases where productive capacity of a certain industry is not being fully utilized because of the lack of raw material, and at the same time raw material producing enterprises are not utilizing their full capacities. The Indian metalworking industry cannot utilize its capacity because of inadequate supply of home produced steel. At the same time there are indications that the capacity of the iron and steel industry in India is not fully utilized. A certain degree of under-utilisation of capacity in this industry is predicted for the future as the following statistics indicate.

Table 9 Capacity and production in the Indian iron and steel industry
(thousand tons)

	1965/66			1970/71		
	Capacity	Production	Rate of capacity utilisation (percentage)	Capacity	Production	Rate of capacity utilisation (percentage)
Steel ingots	8,900	7,100	80	14,600	13,000	91
Finished steel	6,600	5,300	80	11,000	1,000	90
Pig iron for sale	1,200	1,200	100	3,200	3,200	100

Source: National Metallurgical Laboratory Technical Journal, Nov. 1965.

At least 20 per cent of steel ingot and finished steel capacity was not utilized in 1965/1966. A smaller percentage of capacity under-utilisation is expected for the future.

A study conducted by the Indian Institute shows that shortage of raw materials is at present seriously holding up production and preventing the full

utilization of the nation's industrial capacity. Out of a total of 129 returns, 103 units reported the shortage of raw materials as one of the major bottlenecks in production. Raw material scarcity is a simple factor; it is caused by a number of different reasons and exerts various influences on the economy. It is possible to classify general raw material shortage into the following types, each with its specific problems:

- (1) shortage of imported raw material due to a lack of foreign exchange and the ensuing import or exchange restrictions;
- (2) uncertain deliveries of raw materials due to poor supply and/or transport organisation and to communication difficulties, etc.;
- (3) high cost of raw materials;
- (4) inferior quality of raw materials;
- (5) variation of raw material quality and lack of standardisation;
- (6) inadequate supply of indigenous materials;
- (7) local unavailability of certain materials which cannot be imported without difficulty;
- (8) a preventively high cost of raw material transportation.

In Turkey, according to the reply of the Turkish Government to United Nations questionnaires, a shortage of imported raw materials and spare parts has resulted in substantial excess capacity. The same situation is prevalent in the food-processing industry of Brazil. Fifty-four per cent of all replies to the query concerning the main reasons for capacity under-utilisation named difficulties in obtaining raw materials (25 per cent complained of insufficient demand and 21 per cent complained of lack of working capital).

Raw material quality

The inferior quality of raw materials directly affects the degree of industrial capacity utilization. Two independent studies of two very different industries in two distinct countries state that the inferior quality of raw material supply is a very serious factor in this respect. A study on capacity utilization in the welding electrode industry in India reports that the electrode manufacturers state that in spite of a quality premium being charged by the mills there is a high percentage of rejections. The major electrode manufacturers tested a very large percentage of the newly-delivered steel supply and had

extensive consultations with the mills with regard to improving the quality of the steel. A vast amount of time and energy was devoted to securing the right quality of steel and even so, considerable quantities of the steel supply and, on occasions, even the finished product had to be scrapped. When equipment is employed to manufacture products out of raw materials of inferior quality, the result is complete spoilage; the capacity is utilized to produce waste. From the viewpoint of working-hours, the capacity is utilized, but from the point of view of real output - which is the final aim of capacity utilization - it is not.

A study on capacity utilization in the food processing industry of Brazil confirms this conclusion. Twenty-five of the 136 enterprises which reported information on capacity utilisation related to the raw material supply stated that the main reason for the difficulties they experienced in this respect was due to the inferior quality of their raw material supplies.

Several companies producing tin containers in India and visited by the research group studying the problem of excess capacity in this industry gave information very similar to that obtained from the food-processing industry in Brazil. They stated that sometimes sub-standard tinplate had to be enamelled at considerable expense and was then used for such products as talcum powder containers or serving trays. Owing to the inferior quality of raw material, steel sheets and scarce tin could not be used for the intended purposes and were thus either wasted or the processing industries had to bear the cost of reworking the material for other uses. From the viewpoint of capacity utilization this results in a reduction of the actual rate of utilization in terms of final output though the equipment may be used full time doing double work - first to produce waste, then to rework it into other (cheaper) products.

Several Indian enterprises reported significant production losses due to non-standardized or inferior quality raw materials. Six out of 129 units which replied to a National Council of Applied Economic Research questionnaire, reported as much as 25-40 per cent loss in production due to this reason; other units reported losses of up to 20 per cent.

Table 10 gives a more detailed idea of losses in production due to the poor quality of raw materials.

The first part of the report deals with the general situation in the country and the progress of the work during the year. It is followed by a detailed account of the various projects and the results achieved.

The second part of the report describes the work done in the various departments and the progress of the different projects. It is followed by a summary of the results achieved and a list of the publications issued during the year.

The third part of the report deals with the financial situation of the institution and the progress of the work during the year. It is followed by a summary of the results achieved and a list of the publications issued during the year.

Summary

The work of the institution during the year has been carried out in accordance with the plan of work approved at the beginning of the year. The results achieved are summarized in the following table:

economic community. The results are foreign trade restrictions and exchange controls, and hence a discouragement of imports. Because of their lack of significant non-trade foreign exchange earnings, the developing countries are obliged to rely mainly on export and foreign credits. But these countries find that the development of export becomes increasingly difficult due both to the inadequate commodity structure of their export trade as well as to the low efficiency which results in low competitiveness. Export then becomes more and more unprofitable due to the long-term unfavourable trend in terms of trade. Foreign credit also becomes more difficult to obtain and is more expensive, for in the course of time the larger part of previously received credits must be repaid to them with interest and other expenses. In this situation the problem of how limited foreign exchange can be used most efficiently to find a way out of this vicious circle. More and more research studies are coming to the conclusion that a certain re-orientation of priorities is needed in which maintenance imports required for fuller utilization of installed equipment receive greater attention.

At present, top priority (excluding armament and military supplies) is given to the import of capital equipment because it constitutes the basis of industrialization and economic development and cannot be produced locally. But from the viewpoint of economic efficiency and, in the long run, of the progress of industrialization, it is more important to achieve fuller utilization of installed equipment than to import new equipment which may be under-utilized. This is extremely important because fuller utilization of installed equipment might well be the factor which breaks the vicious circle.

Under-utilization of capacity is one of the most important factors affecting competitiveness and cost reduction in developing countries. Fuller utilization may help to bring goods on to the world market and to increase exports while providing better help to industrialization than continual new industrial construction without fully utilizing the capacity added during the course of the construction. At present, unfortunately, the needs of developing countries for maintenance imports are much too great.

Complaints regarding the shortage of foreign exchange are frequent. Many firms questioned about the factors responsible for under-utilisation mentioned foreign exchange difficulties. Eleven units complained of foreign exchange shortage ranging from 40 to 90 per cent of their needs.

In India needs for maintenance imports proved to be so high during the third five-year plan that they could not be covered with foreign trade gains. The plan had to accept the inevitability of a certain degree of industrial capacity under-utilisation.

For the years 1961/66 it was estimated that the needs of Indian economy in imported raw materials, components, spare parts, etc. were about Rs.3,800 crores. The third five-year plan's provisions for the import of these goods was only Rs.3,650 crores. The plan admitted: "this means that some under-utilisation of capacity will have to be tolerated" (p.114). For India, maintenance of import is equal to approximately 30 per cent of the capital goods import for both public and private sectors.

The Indian Institute made its own estimation of foreign exchange required for the import of raw material in addition to that which was allotted to the manufacturing industry as a whole.

Table 11. Industry-wide allocation of foreign exchange and estimated additional requirements for the import of raw materials

(1961)

	Amount of foreign exchange allotted Rs.(crores)	Additional foreign exchange required Rs.(crores)
Metal products	6.37	1.93
Machinery (except electrical machines)	8.49	8.69
Electrical machinery and appliances	21.07	10.25
Transport equipment	24.61	14.57
Chemicals and chemical products	29.83	10.38

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It is not easy to determine the amount of foreign exchange needed to achieve full utilization of installed capacity. One study of under-utilization in Indian industry states that on the basis of available data no further analysis is possible to make any firm estimates of total foreign exchange requirements to enable the units in these industries even to operate to their full existing capacity on their existing shift arrangements. It is even more difficult to make an estimate of what the requirements will be for the utilization of capacity, when the capacity has reference to desirable shifts.

A special study on the estimate of foreign exchange requirements for fuller utilization of Indian manufacturing capacity reached some important conclusions:

- (i) increase of production activity by one shift in Indian engineering and chemical sectors would call for some 670 million dollars worth of maintenance imports;
- (ii) the imported components, raw materials, etc. represent 25 per cent of the ex-factory of industrial production;
- (iii) thus the value of production resulting from an increase of imports would be 2,680 million dollars and the value added, 800 million dollars.

This study suggested that fundamental changes be made in the pattern of foreign exchange allocations for import, re-directing foreign exchange resources from import of new capacity equipment to an increase of maintenance import in order to achieve fuller utilization of existing installed capacity. A review of 1964 import statistics revealed that some 840 million dollars worth of machinery and transport equipment were imported; approximately 400 million of this total represented replacement machinery, components and spare parts. The balance (640 million dollars) may well represent project or other capital equipment. If 400 million dollars of additional non-project aid were made available together with 270 million dollars diverted from the 640 to maintenance imports, it would be possible to meet the estimated need of 670 million dollars for maintenance imports while still providing some 370 million dollars for additions to capacity.

A paper on trade restrictions and on the attempts of liberalizing trade in Pakistan stated that after a free list on raw materials and spare parts was introduced capacity utilization rose. Utilization of industrial capacity in Pakistan from July to December 1963 was 53 per cent; during the period from January to March 1965 it was 82 per cent.

The paper stated that Pakistan's interest in industrialization had meant a policy of securing the import of capital goods. Raw material imports had not been encouraged as strongly as capital imports. Raw material import licenses were on the basis of one-shift operations. This encouraged overbuilding of capacity rather than the intensive use of existing capacity. Because of the scarcity of raw material, firms were run at less than one-shift operations. In order to obtain raw material import licenses and to expand output firms tended to overbuild their plants. Industrial firms thus operated at 50 per cent of their capacity. From 1960/61 to 1962/63, capital goods imports rose 90 per cent while raw material imports remained almost constant. All the needed raw materials could not be obtained locally, thus a black market developed and idle capacity continued.

In India, as in Pakistan, there was an under-utilization of capacity due to the lack of needed raw material imports. Capacity under-utilization before devaluation was estimated at 15 to 20 per cent. Firms tended to overbuild capacity so as to get needed raw material import licenses.

The shortage of foreign exchange for the import of components, raw materials and spare parts are some of the most important factors limiting the full utilization of manufacturing capacity.

The demand for final product in many Indian manufacturing industries is, at the present time, substantially less than full capacity output in the technical sense. It appears that nearly all firms in these industries have responded to years of shortages and high profits by steadily expanding their capacities well beyond the limits indicated in the Industries Act licences. This was possible due to a number of factors: the considerable range of use of indigenous equipment that can be purchased without a licence; the difficulty of defining the capacity of any particular piece of equipment; the sensible willingness of the Directorate General of Technical Development (DGTD) to permit the import of a foreign machine even if its capacity was somewhat larger than was envisaged by the Industries Act licence; and the inability of the officers of the DGTD, owing to their other duties, to visit the factories more than once every two or three years.

The firms concerned were prepared to invest in new plants even though the existing capacity was not fully utilized, because the individual firms were not aware of the true extent of expansion undertaken by others. Apart from the very large firms in each industry, little interest has been shown in marketing problems because of the current existence of a seller market; few attempts have been made to analyze carefully the demand for the products of the industry as a whole over the coming years.

In many industries the share of imported material is small in relation to the value of the finished product, and there would be significant gains to the economy if an adequate supply of imported material were made available. In the case of welding electrodes (India), lack of the right type of electrodes due to the inadequacy of imported materials resulted in a great waste of scarce metals which also had to be imported.

In the case of tin containers manufacturing industry, the value of imported tin plate in the total value of products packaged in tin containers is relatively small. The retail sales value of items packed per 1,000 tons of tinplate, which costs about Rs.10,000,000 is as follows.

Table 12 Value of imported tinplate in the total value of tinned products

Product	Retail sales value of product	Cost of tinplate (percentage of product value)
Milk and allied products	Rs.33,000,000	3.6
Vanaspathi and edible oils	Rs.49,000,000	2.5
Cashew	Rs.61,000,000	2.0
Paint and varnish	Rs.76,000,000	1.5
Lubricant and greases	Rs.26,000,000	5.0

Shortages of key imported items of small value appear to result in disproportionate production losses. It should be possible to alleviate this situation without additional outlay of foreign exchange. It would be desirable to rationalize the pattern of export assistance by establishing a proper price for the supply of indigenous steel and by reducing the quantities of the import entitlement.

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The above-mentioned study in India found that during the period under study, production of steel billet for welding electrodes had to be suspended in one case because the company had been unable to obtain graphite electrodes. Since in this case a large investment had been made in a modern plant to produce both billet and wire, the decline to be expected in the output of finished electrodes was altogether disproportionate to the foreign exchange involved to import the needed graphite electrodes.

The same study found that shortage of rutile, which is used to cover metal rods during the manufacture of welding electrodes led to production stoppages. Referring to a specific period which it considered the study confirms that when the lower level of domestic production in recent months actually affected the availability of rutile of electrode plants, production of electrodes was certainly to be affected too. The cost in foreign exchange of rutile was about 3 per cent of the value of finished electrodes, thus we have another example of a requirement of small value acting as a significant restraint on production.

The third kind of material in short supply which, according to the study, affected the production of welding electrodes was special and alloy steels. In so far as special electrodes are concerned the requirements of special and alloy steels are not being adequately met. The present shortfall amounts to some 10 million running feet, requiring 250 tons of special steel valued at Rs.2,300,000. This relatively small value of special raw material assumes added significance since in the absence of special electrodes certain cost-saving and critical welding techniques cannot be accomplished.

Table 13 Overall estimates of the increase in foreign exchange allocations required to meet current welding production demands

	Rs.
Special steels and non-ferrous wires	2,300,000
Rutile	400,000
Ferro-alloys	60,000
Other chemicals	20,000
Spare parts	10,000
Total	2,790,000

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This amount, equal to US \$600,000, is relatively small as compared to the production losses suffered by the industry as a result of the above cited shortages.

This comparatively small but typical section of Indian industry producing welding electrodes suffers from a deficiency of at least five major raw materials. The deficiency affects the production and increases the burden of under-utilized capacity. In each case, the expenditures of foreign exchange needed to import scarce raw materials are relatively small compared with the losses of the industry due to the lack of these materials. Since these raw materials cannot be produced locally, measures are needed for allocating the necessary foreign exchange for maintenance imports. If, however, there is only a limited domestic demand the desirability of building capacities for the production of these materials should be studied.

The inferior quality and the lack of scarce raw materials affect the rate of capacity utilization directly (relatively limited production despite the high demand) and indirectly (reduced demand due to the inferior quality of the manufactured goods).

The above-mentioned study on the tin container industry in India can serve as an example. To obtain maximum results with a limited supply of tinplate larger sized cans than necessary were produced. While customers' demand would normally call for containers of convenient size for individual consumers (1 kilo or even $\frac{1}{2}$ kilo), products were packed in 2 or 4 kilo sizes. While this process saved tinplate, it frequently led to the ultimate consumer getting food from already opened cans. The results were increased opportunities for food adulteration and exposure of food to insanitary conditions. In a situation where tinplate is freely available, experience all over the world shows that the demand for smaller sized cans increases.

In the tin containers manufacturing industry the estimated increase in foreign exchange allocations required to meet current demand is:

for tinplate	-	Rs. 18,000,000
for spare parts	-	Rs. <u>300,000</u>
total		Rs. <u>18,300,000</u>

This amount is very small compared with losses arising from the low level of installed capacity utilization.

In evaluating the tin container export, both direct and indirect exports have to be considered. For example, the Metal Box Company has direct export of about Rs. 3,200,000, but the value of indirect exports of such products as cashew nuts, prawns and biscuits is several times this figure.

Metal Box reported that they need a steady annual supply of about 1300 tons of imported electrolytic tinplate to maintain their present rate of export built up over the last seven or eight years.

Labour

One of the important factors hindering production in developing countries and preventing better utilization of the industrial capacity is the labour problem. This problem has two aspects:

- (1) general shortage of skilled labour and acute shortage of special skills;
- (2) labour troubles caused by dissatisfaction of the skilled workers with present living and working conditions, work stoppages and absenteeism.

Difficulties in recruiting enough suitably qualified and trained labour were stressed as major reasons for the low capacity utilization in the timber, the textile and the metal industries of Chile.

The Indian study on industrial capacity under-utilization mentioned the lack of certain skills and a general shortage of skilled labour among the main causes delaying fuller utilization of capacity. It listed various types of skilled labour, which are scarcest in the industries strongly affected by the capacity under-utilization. In the metal products industry these are: tool and die-makers, designers, turners, fitters and soldermen. In machinery production: toolroom and maintenance staff, turners, fitters, moulders, millers, grinders, borers and other machinists. In electrical machinery and appliances production: toolroom fitters, die-makers, welders, machine shop operators. In transport equipment production: tool cutter, grinder, machine tool and millwright fitters. In chemical industry and industries using chemicals: tinsmiths, blacksmiths, varnish makers, and colour matchers, laboratory assistants and analytical chemists for drugs and pharmaceutical production.

Developing countries have only a short tradition in training labour if compared with developed countries, where often many generations of the same family worked in the same trade, while in developing countries illiterate peasants are called to become modern industrial workers. The training of a skilled worker needs more time than is required to build a modern industrial enterprise and proves very expensive. Therefore, the problem of labour planning and labour training is given much attention by the national authorities and the international organizations. Many specialists, however, are not satisfied with the present methods.

The Indian Institute complained about the neglect of this problem both by the authorities and by the business community. According to M.K. Singh labour discontent and absenteeism are causes of capacity under-utilization in a number of cases.

Work stoppages and absenteeism are undoubtedly reasons for capacity under-utilization in those countries and industries where labour relations are a source of dispute. Labour troubles reduce capacity utilization which often cannot be compensated for by overtime work at a later date. In many cases labour disputes decreased not only the capacity utilization of one particular enterprise where work had been ceased, but also that of other enterprises which ran short of material as a result of work stoppages at their suppliers. An example for this is given in the study on the capacity utilization in the welding electrodes industry of India. The main chemical required to produce electrodes is rutile, used in the flux coating on the electrode. Though indigenous supplies were available from Kerala, the production of rutile had been reduced significantly in recent months due to labour trouble. The gap between indigenous production and actual requirement was only met in part through imports. The low level of domestic production thus affected the availability of rutile at electrode plants, the production of electrodes and the capacity utilization of these plants.

2/ V.K. Ramaswami and D.G. Proutz, Utilization of Industrial Capacity, New Delhi, 1965.

Need for better planning and management

Modern industrial production and the structure of market demand are so complex that even in developed countries internal disproportions occur. In developing countries these disproportions are more acute and more difficult to deal with because of the lack of industrial reserves, less diversified production, a weaker economic infra-structure and less developed economic services. Hence there exists capacity under-utilisation side by side with unsatisfied demand. If the excess capacity is slightly different from that needed at the moment the demand cannot be met by production.

An example of this kind can be found in a special study on excess capacity in selected Indian industries. On the whole, the installed capacity of the galvanized pipes and tubes manufacturing industry in India slightly exceeds the current domestic demand. At present, however, the demand for the smaller sizes (one-half and three-quarters of an inch) cannot be met while the demand for the larger sizes (1 inch and more) seems to be decreasing.

From the economic point of view idle capacity in one type of operation may be quite compatible with unfulfilled orders in another sector of an industry. An absolute balance between capacity and production is not feasible, but the degree of disproportions can be significantly reduced through careful economic planning. It is no exaggeration to say that the existence of excess capacity is an evil emerging from either lack of planning and poor project evaluation at the time when the capacity was installed, or from some unfavourable economic developments like the failure of market expansion, shortage of production material, etc.

Fluctuations of demand which cannot be foreseen are serious causes of the low level of capacity utilization, especially during certain periods. In some instances these fluctuations can result from governmental economic policy. When the government is the main consumer of the industrial goods in question, a reduction of the government orders, which cannot be easily replaced by orders from other industries, may become a major cause of a drastic increase in the level of unused capacity and a general economic setback. Some Indian economists believe that a situation such as this was experienced in India at the beginning

of 1967 due to the slackness in Government demand and an acute shortage of rupee finance. Lack of demand, particularly from the railway sector, had seriously affected not only the wagon building industry, structural fabrication and steel castings, but also a host of auxiliary industries. The situation was so serious that many of these industries - mostly in the eastern part of India - were working only 40 to 50 per cent of their capacity and have been keeping idle labour on their payroll, thereby adding to their expenses. Unless the Government's demand will be revived very quickly, some Indian economists believe that an important sector of the Indian engineering industry will face a crisis, which would have disastrous effects on the future development of the country.

In certain cases some capacities can be installed deliberately in excess of market demand. Such decisions are justifiable if

- (1) the technological conditions do not permit the construction of an enterprise of a smaller size;
- (2) a smaller enterprise is not economical;
- (3) the acting authority believes in the future growth of the demand and plans are being made for reserve capacity.

There is, however, no justification if the excess capacity is installed with speculative aims to gain some advantages and privileges arising from the mere fact of possessing a large capacity without fully utilizing it.

Some Indian economists believe that in many Indian industries a substantial part of capacity under-utilization is due to the indiscriminate licensing of larger capacity installations than required by the normal demand for the products. R.K. Singh claims that in the industries with acute cases of capacity under-utilization (production of bandsaw blades, expanded metal, bare copper conductors, semi-automatic and automatic stoves, calico looms) the capacity installed at the end of 1955 was adequate to meet the levels of the 1960 and 1965 production, yet the capacity was continuously increased since 1955.

One of the causes of excess capacity in the manufacturing industry of developing countries is the inadequate development of the economic mechanism servicing the modern process of production (e.g. mechanism of distribution, credit system, and so on). In developed countries technical progress, concentration of production and growth of industrial modern mass production

based on a thorough division of labour and specialisation which is accompanied by the corresponding development of the economic services such as banking and insurance, the wholesale and retail trade and the system of transport and communication. Many developing countries introducing the modern production methods from developed countries lack the corresponding economic services and are thus unable to fully utilise their installed productive capacity.

There is evidence that the newly built sugar factories in some parts of Brazil cannot utilise their productive capacity although the farmers of these regions produce enough sugar cane. Due to the lack of cash circulation, capital, the factories are unable to buy the crops. The farmers cannot sell their crops, the factories cannot buy the raw material. In this particular case there is no credit system capable of bridging the gap between sellers and buyers. A similar example is reported from Chile. In a special report submitted to the United Nations Centre for Industrial Development, P.J. Glover considers the shortage of credit for the purchases of raw materials and for carrying stocks of finished goods an important cause of capacity under-utilisation in Chile.

An underdeveloped economy may have a deficiency of demand together with continuous inflation. It seems difficult to explain otherwise the persistence of substantial excess capacity despite an almost permanent inflation.

A major non-import bottleneck preventing full capacity utilisation is the shortage of electric power supply. This bottleneck cannot be eliminated rapidly as long as at least three years are needed to build a new thermal power plant for which some of the essential equipment has to be imported. But there is the possibility of using electric power during the slack hours if the manufacturing enterprises work night shifts. Estimations by the Gujarat State Electricity Board in India for the Gujarat power system in 1956/57 show that an increase in electricity consumption of nearly 100 per cent could be accommodated between 9 p.m. and 8 a.m. before the peak loading capacity of the system would be exceeded.

Shortage of electric power becomes a serious problem when new plants are created or additions to plant capacity considered, which would increase the peak load requirements for electricity.

Section 1: Introduction

The following information is provided for your reference.

1. The first item is a list of names and their corresponding addresses.

2. The second item is a list of dates and the events that occurred on those dates.

3. The third item is a list of items and their respective quantities.

4. The fourth item is a list of names and their respective titles.

5. The fifth item is a list of names and their respective addresses.

6. The sixth item is a list of names and their respective addresses.

7. The seventh item is a list of names and their respective addresses.

8. The eighth item is a list of names and their respective addresses.

9. The ninth item is a list of names and their respective addresses.

10. The tenth item is a list of names and their respective addresses.

The first part of the report deals with the general situation of the country and the progress of the work done during the year. It is followed by a detailed account of the various projects and schemes which have been carried out, and a summary of the results achieved. The report concludes with a statement of the work planned for the next year.

The work done during the year has been very satisfactory, and it is hoped that the results achieved will be of great benefit to the country. The various projects and schemes which have been carried out have all been successful, and it is hoped that the results achieved will be of great benefit to the country.

The work planned for the next year is very extensive, and it is hoped that the results achieved will be of great benefit to the country. The various projects and schemes which have been carried out have all been successful, and it is hoped that the results achieved will be of great benefit to the country.

The second part of the report deals with the financial position of the country and the progress of the work done during the year. It is followed by a detailed account of the various projects and schemes which have been carried out, and a summary of the results achieved. The report concludes with a statement of the work planned for the next year.

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THE SECRETARY GENERAL

Table 14 Comparative CIF and internal costs of production
(prices for selected items)

Industry	CIF Prices (post-devaluation) in Rs. per ton	Indian cost of production (post-devaluation) in Rs. per ton
Steel castings	..	2,740
Steel forgings	4,500	4,200
Steel pipes and tubes	1,478	1,450
Wire ropes	3,100	3,650
Welding electrodes	110 per 100 R ft	100 per 100 R ft
Hand tools	11,500	8,500
Brake-linings	10,000	9,075

Source: Note on Supply Capacity in Indian Industry and Comparative Indian and International Prices, Communication sent to UNIDO from ICICI, India, February 1967.

N.B.: In addition to material, labour and utility charges, cost of production also includes amort and depreciation charges

According to the study undertaken jointly by a group of experts of the United States Agency for International Development and the Indian Government, the possibilities of the utilisation of excess capacity in welding electrodes industry for export are very low because of the specific price structure in India which is different from the price structure on the world market. The price of domestic core wire, which is the main raw material, is very high; export prices for the final product are very low. In the absence of properly considered export incentives this Indian industry cannot compete on the export market.

The same problem arises when there is a possibility to increase export at the expense of profitability. Since capacity is often measured as the output produced at minimum average total cost, the physical (technical) capacity is usually larger than this capacity and sometimes the enterprise works with a capacity utilisation of more than 100 per cent. In such a case the costs per unit of output increase while the profitability of the enterprise decreases. But sometimes a country is ready to accept higher costs per unit of output to gain badly needed foreign exchange for its economy. In such circumstances, the higher-than-100 per cent utilization of capacity can prove reasonable. In comparing level of profitability, expressed in local often non-convertible money units with probable gains of foreign exchange as the result of the above-100-per-cent utilization of productive capacity, the official rate of exchange should not be used, especially if there exists a much higher unofficial rate of exchange either legally or illegally. Individual enterprises, on the other hand, are not interested in excess utilization of their productive capacity if this entails increases in the cost per unit ratio, even if the additional output is to be sold on the world market for foreign exchange. For the promotion of export the state, as the receiver of foreign exchange earned on the world market, should therefore provide some sort of incentives for these enterprises.

Summary

Causes of excess capacity in developing countries are in most cases different from those in developed countries. This difference is twofold. First, the excess capacity is mostly connected with the imbalances of external economic

relations (e.g. short supplies of imported raw material, spare parts, etc. or inadequate domestic markets and the greater importance of export markets). Second, the excess capacity in developing countries is also connected with the absence of certain prerequisites in their economic structure, preventing the full integration of the industrial enterprise with the economy as a whole. The gradual growth of industrial technology in developed countries either anticipated or was accompanied by corresponding developments in all inter-connected industries and in other economic fields (marketing and credit, banking, foreign trade, means of transport and communication, labour training, etc.). In developing countries, however, imported technology can often not be utilized effectively due to inadequate (or a complete lack of) corresponding economic and social conditions. Modern technology - imported by developing countries in the process of their industrialization - is based on the principles of mass production for a market much larger than the market in the largest developing country. However, modern industrial enterprise cannot function in a vacuum. It can only be effectively utilized once it has become an integral part of our economic community which supplies the enterprise with the necessary inputs and absorbs its products. Therefore the country, that does not possess all inputs necessary for its industries, is also unable to absorb their products and depends on the world market. That is why a high percentage of industrial enterprises in developing countries can utilize their production capacity only if the world market supplies the materials needed for production and absorbs the goods produced in excess of domestic demand.

Erecting one or a number of industrial enterprises in a developing country, especially in a smaller one, introduces a new powerful economic element. If efficiently operated the new enterprise may be advantageous for the economy as a whole, otherwise it may just become an additional burden. Each non-industrial enterprise established in a developing country creates a problem of corresponding adjustments for all other economic sectors. If these adjustments are successful, the new enterprise can function normally and efficiently; but if these adjustments go wrong, the new enterprise may prove inefficient. It may work with a high degree of capacity utilization and still add to the economic shortages of the country. Thus there is an indispensable need for nation-wide economic planning.

in developing countries, which should evaluate all economic proportions and lay down the necessary provisions for the most efficient utilization of newly installed industrial capacity. With regard to the specific conditions of industrialization in developing countries, national planning should also take the necessary measures in the field of external economic relations, especially provide export outlets for the products of newly installed industrial capacity.

IV. CONCLUSIONS AND RECOMMENDATIONS

Capacity under-utilization is a major economic problem of the developing countries, which leads to low efficiency in industries, economic difficulties and bottlenecks. The importance of this problem grows with the progress of industrialization. The degree of capacity under-utilization can reach such a level that industrialization which is rightly regarded as the main road to economic development may become the main source of economic difficulties. It is necessary to pay special attention to the problem of capacity utilization in overall economic plans (as in India's third five-year plan) and in each industrial project. UNIDO should assist the developing countries in solving this problem of capacity utilization.

Necessity of improved statistics

Reliable data on the present rate of capacity utilization and a precise knowledge of the reasons for capacity under-utilization are necessary for setting up programmes of technical assistance. These programmes should help developing countries to use the excess capacity in some of their manufacturing industries or, on a smaller scale, in individual production units. Available data, however, are incomplete and unreliable, in some cases non-existent.

Under-utilization of industrial capacity is a major economic problem in developing countries. There are no comprehensive statistics on capacity measurement or on estimations of the degree of its utilisation. For better and more efficient utilization of existing capital equipment comprehensive information on the installed productive capacities and their use is needed. The difficulty in studying the problem of excess capacity lies in the scarcity of statistical

data. No country, including the United States publishes in its detailed statistics on the production of a wide range of manufactured goods, comprehensive enough information on the rate of utilization of productive capacity, nor on the level of present capacity which could be compared with the volume of production. Some developing countries carried their statistics on capacity and capacity utilization a bit further than the developed countries did. Estimates on the manufacturing capacity in different industries can be found in the statistical publications of India, Brazil and Argentina. These data are often vague and incomparable (due to the lack of facilities, proper methodology and standardised definitions). Every attempt, however, to estimate the rate of capacity utilization in any country is of considerable interest as it throws light on the various kinds of capacity utilization and the methodological problems connected with capacity measurement. The experience of developed countries with regard to excess capacity may also be useful for developing countries.

Different methods for measuring capacity were developed in the United States. There are no optimal solutions of the problem, not even for the country where they originated from, nor can they easily be applied to developing countries. But the experience gained by economists and economic institutions conducting these studies is of great value for working out methods and techniques for the measurement of capacity and the rate of capacity utilization in the developing countries.

For instance, India includes special information on the current level of industrial capacity in its monthly economic statistics. But even in India, the problem of statistics on capacity and capacity utilization has not yet been solved, though the need for better capacity utilization has been recognized for some time. The Indian Import and Export Policy Committee recommended that the development wing should be charged with the responsibility of constantly reviewing the problem of under-utilization of industrial capacity and of recommending remedial measures. It suggested that the results of such reviews should be published annually, but unfortunately this recommendation made in early 1962 has not been followed up.

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In India the capacity of a majority of industries is calculated on single shift basis. Only for the following industries the full utilization of capacity is estimated on multi-shift basis. Three shifts - sulphuric acid, caustic soda, soda ash, chlorine liquid, bleaching powder, bicromate, super-phosphates, ammonium sulphate, paper and paper board, tyres and tubes, alcohol, cement; two shifts - paints and varnishes, cording engines, rim spinning frames, railway wagons, re-welding electrodes, wire ropes, steel pipes and tubes, cigarettes.

But some industries for which capacity is measured on the one-shift basis, often work two shifts, or at least multi-shifts for a certain period of time. In the statistics this is reflected in a more than 100 per cent rate of capacity utilization.

The following data on installed capacity, production and the rate of capacity utilization were calculated from the monthly statistics of the production of selected industries of India for December 1965. They illustrate the gap between actual production and estimated installed capacity.

Table 15 Production of house service electric meters (average monthly figures)

Year	Installed capacity	Production
1960	32,000	40,036
1961	37,000	52,663
1962	47,000	73,145
1963	84,166	99,469
1964	96,666	101,311

This gap is also evident in the radio and fluorescent lamp industries.

Table 16 Production of radio receivers (average monthly figures)

Year	Installed capacity	Production
1962	27,692	28,607
1963	32,525	34,955
1965 June	32,626	44,321

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Table 17 Production of fluorescent lamps (average monthly numbers in thousands)

Year	Installed capacity	Production
1960	100	127.2
1962	258	265
1963	275	303
1965 June	375	386

Similar data are available for the production of dry cells, storage, electric batteries, winding wires, electric meters and refrigerators. The most striking example is the production of transformers. The 1965 production (throughout the year) was nearly three as high as the installed capacity reported in the official statistical publication.

Table 18 Production of transformers (average monthly figures)

1965	Installed capacity	Production
January	176.8	369.9
February	176.8	335.6
March	176.8	376.3
April	176.8	293.3
May	176.8	325.6
June	176.8	362.6
July	176.8	360.0
August	176.8	339.9
September	176.8	347.7
October	176.8	376.7
November	176.8	419.8

In some cases estimations for installed capacity were changed from year to year for no obvious reason. It is natural that installed capacity changes in the course of time, mostly showing an upward trend. Under special circumstances new investments may also reduce installed capacity. But this can hardly be the case with some Indian manufacturing industries where within a few months installed capacity was drastically reduced. In December 1964 the reported installed capacity of the production of carding engines (revolving flat cards) was 213, in June 1965 it fell to 90; actual production was 145 in June 1965.

Similar data are available for the production of complete ring spinning frames (installed capacity in 1964 - 113, in June 1965 - 140; production in June 1965 - 182), and the production of semi-automatic and automatic calico looms (installed capacity in March 1965 - 1,360, in June 1965 - 783 with production increasing correspondingly from 190 to 440).

These examples show that officially estimated and published data on industrial capacity may vary from actual capacity. But there is no doubt that when actual production figures are lower than the installed capacity figures the latter reflect the actual capacity. For many years there were strong incentives in India to overestimate capacity, yet capacity was often underestimated.

For many reasons installed capacity figures are less exact and reliable than production figures. For instance when installing additional imported equipment Indian companies receive special industrial licenses which also give estimations on the productive capacity of the new equipment. If, however, the capacity increases without the installment of additional imported equipment the government statistical organizations receive no information on the increase in capacity. In addition, the share of locally produced new equipment for Indian industry continuously increases and sometimes the machinery, purchased either abroad or at home, has a much higher capacity than its rated capacity reported in the licenses. The capacity of the equipment can be greatly increased with minor additions of equipment or minor innovations at the spot. All these circumstances are not reflected in the statistics on capacity.

Since statistics on installed capacity are not very reliable - partly because of the irregularity of information submitted to the statistical organizations (e.g. the Directorate General of Technical Development in India) - rates of capacity utilization are estimated by comparing the data of current output with the obsolete data of capacity. In Indian statistics data on installed capacity refer to the close of a period. The longer this period lasts the greater will be the rate of capacity under-utilization, especially if the growth of the capacity is significant. If there is any growth of the capacity within the period the statistical report compiled on this basis will never register full

utilization even in the case of actual full utilization. For the same reason it is impossible to refer capacity to the beginning of the period, but attempts to calculate the average capacity during the period make the task of capacity measurement even more complex.

For many types of equipment statistical publications do not give any estimation of capacity as they are produced not regularly, but to individual orders (e.g. all types of tea machinery, sugar machinery, and so on).

In certain circumstances government authorities are interested in deliberate under-estimation of officially reported industrial capacity. For example, the Director General of Technical Development of India was unwilling to recognize the increase of installed capacity at some plants producing welding electrodes because the allocations of scarce foreign exchange are to some extent based on capacity, to recognize an increase would imply a commitment to authorize larger allocations of foreign exchange.

The real maximum production potential of a plant or industry is usually much higher than the officially reported capacity. For instance, official statistical publications never estimated production in any industry of India as low as 20 per cent of the capacity. At the same time, M.J. Solomon, who studied the problem of capacity utilization in India insists that "there is reason to believe that many Indian plants can increase their output up to 500 per cent with little or no increase of investments in fixed plant".^{6/}

Users of capacity measures find the available data inadequate for their needs because of: (1) lack of consistent definitions and rules of measurement; (2) insufficient coverage; (3) lack of details in existing data; (4) lack of regular reports on capacity increases; (5) lack of integration with other economic measures (output, employment, etc.) at both the aggregate and detailed industry and product levels.

The Indian National Council of Applied Economic Research too considers that there is a lack of precise information on the capacity utilization. They report that capacity figures are not available for 16 industries for the years 1955/64 and for 54 industries, for some other years. Data regarding the

^{6/} Morris J. Solomon, Better Plant Utilization in India - A Blueprint for Action, Indian Statistical Institute, 1963, p.1.

weights to be assigned to various products (the weights used in the construction of the industrial production index) are not available for about 90 per cent of shifts worked. A number of industries show excess utilization for the obvious reason that they work more than one shift although the published data from governmental sources indicate that they work one shift only.

Need for standard definitions and measurements

The term "capacity" in present economic literature and in statistical publications has been given a variety of meanings. In general this term refers to the quantity of output produced per unit of time with a given supply of plant and equipment. Usually it is assumed that labour and materials are available in the necessary quantities and qualities, and that the limiting factors are stock of plant and equipment, and operating standards.

The absence of generally recognized concepts and definitions of capacity cause a wide variety of capacity estimations which cannot be compared or related to other economic indicators. Except for a few individual industries, there are no set rules on the measurement of capacity. This explains the present unsatisfactory state of measuring capacity, the different methods of measuring and the confusion in the interpretation of existing (official and unofficial) data.

In general, definitions of capacity can be divided into two categories: the "engineering" and the "economic" concepts. The engineer's concept is physical, denoting the maximum physical output produced per unit of time with a given fixed stock of capacity facilities. This capacity rate of output is the maximum that can be produced with an uninterrupted flow of variable inputs and without actual breakdown or the incurring of some explicitly or implicitly as used "exceptionally high" marginal costs of operation.

The economic concept also refers to output, but not always to maximum output. It takes the cost element into account. According to this concept capacity is the rate of output produced at a minimum average total cost per unit of output. According to the economic concept the capacity of the enterprise depends not only on its stock of plant and equipment but also on the market conditions - wage rates (including overtime), price fluctuations, and so on. Capacity

measurement becomes an economic-mathematical problem; to find out the rate of output which under given conditions provides the maximum profit for the enterprise. This aspect of capacity has also been called rated capacity, effective capacity, preferred capacity, and so on.

As a rule "economic" capacity is only one part of the "engineering" capacity. It does not take into account all possible reserve which can be used if there is a need to increase production. Moreover, under the influence of changing market conditions the rate of "economic" capacity can fluctuate without any changes in real fixed assets.

Economists and business people dealing with problems of capacity measurement usually make a distinction between "theoretical" or "rated" capacity and "practical" capacity. "Theoretical" capacity estimations take into account given plant facilities, an uninterrupted flow of variable inputs (labour and materials) and a "normal" organization of production. They may or may not include an allowance for seasonal fluctuation in output and for unavoidable shut-downs.

When measuring the capacity, the following factors are usually recognized: normal work stoppages for repairs and maintenance of the equipment, fitting and re-fitting the equipment for production of specific items, normal speed of operation or intensity of productive processes, average number of shifts normally employed in the industry and number of working days during the week, month, year and some other standards which may vary in different countries even within the same industry or in different industries within the same country.

There is no universally adopted definition of capacity or excess capacity. Each company sets its own definition and measurements following a common sense explanation of capacity as maximum output under normal work schedules. The result of this is multiplications of definitions when one company measures its own capacity in different volumes for different conditions: recession capacity, boom capacity, normal capacity, and so on. This method of measurement does produce exact data and often a company reports that it is working on the level of a 120 per cent capacity.

The British economists M.A.H. Godley and J. R. Shepherd give the following definition of capacity from the point of view of labour supply. Capacity (productive potential) is the level of output, at any one point of time, which would make equilibrium employment equal to the labour supply. ¹

The capacity of separate pieces of equipment to do the same work will have equal the total capacity of the enterprise. The capacity of an enterprise with a given stock of equipment can vary depending on the type of product produced within a given time period. The capacity of a single industry cannot be defined very accurately either, because an enterprise can produce goods of several under different sections. Capacity of the manufacturing industry as a whole is still more difficult to define and to measure.

Excess capacity existing at each individual enterprise can be calculated more or less accurately, but the total sum up of excess capacity of all individual enterprises not always equals the excess capacity of the industry. As M.J. Solomon has shown in his book "Better Plant Utilization in India" (1963), the problem of plant utilization from the viewpoint of the individual enterprise and from the viewpoint of the economy as a whole is different and should be discussed separately.

The concept of capacity is also misleading when considered for an industry as a whole, because the products of individual firms differ so much in quality. A low quality and cheap product may of course satisfy a felt demand admirably. While a high precision bolt, for instance, is essential for structural work or vehicle manufacture, a lower quality bolt may be quite adequate for other purposes. One category of consumers may want a high quality product while another category may be satisfied with lesser quality for the same purpose. The main automobile manufacturers, for example, apply very high quality standards to leaf springs and nuts; in the replacement market, however, lower quality and cheaper products find ready sales.

¹ M.A.H. Godley and J.R. Shepherd, National Institute Economic Review No. 29, Aug. 1964, p. 37.

value of production potential of the factories which may vary depending on percentage recovery of sugar from cane. With the same daily cane crushing capacity and the same number of actual working days the output of the factory can vary if the average percentage recovery of sugar from cane fluctuates.

As the number of actual working days and the average percentage recovery of sugar from cane vary considerably from region to region and also from season to season within the same region, sugar factories in the different areas are grouped into three broad regions according to similarity of climate and other factors: (1) northern region comprising United Provinces, Bihar, Punjab, West Bengal, Assam, Orissa, Madhya-Pradesh and Rajasthan, (2) Bombay State, (3) southern region comprising Madras, Kerala, Andhra-Pradesh and Mysore. Based on information on two seasons (1957/58 and 1958/59) the average number of working days was estimated at 115 days for the northern region, 130 days for Bombay and 130 days for the southern region. Similarly the percentage recovery of sugar was estimated at 9.7, 11.3 and 9.5 respectively for the three regions. The daily cane crushing capacity of individual factories was aggregated for each region and multiplied by the product of average number of working days and the percentage of recovery of sugar cane in the region. The capacity thus determined on a regional basis was added up to arrive at the installed capacity of the industry as a whole.

Even more complex is the problem of measuring capacity and capacity utilization of industries which - unlike the sugar industry - produce a variety of products. On the basis of its main product an enterprise belongs to a certain section of the food-processing industry. But one part of its production may well belong to some other section. For example, enterprises listed in the section of crushing, toasting and grinding of food products also produce seed oils which normally should be listed in another section of food production. Available studies on the food-processing industry, especially the one recently conducted in Brazil, do not attempt to provide more accurate classifications of capacity than according to the official distribution of enterprises between sections of an industry.

It may be useful to define capacity not only for a particular end product, but also in a more general way so as to point out possible scopes for adjusting the output pattern according to changing demand conditions. Capacity could, for

example, be expressed in terms of metal tonnage that can be converted into fabricated light engineering products, or other raw materials that can be consumed (as in the case of petroleum refineries).

In firms depending more on human labour than technical equipment the concept of capacity is particularly ambiguous. The productive potential of such an enterprise may increase by employing additional manpower without any changes in the fixed assets.

Capacity of closed factories, being ineffective, should be treated differently. This capacity can be used under certain conditions even if its technical efficiency does not change. These factories can become effective again if demand grows, prices rise or import restrictions are imposed. Their capacity can be regarded as the industrial reserve capacity of the nation. In any case the factories represent a certain volume of the nation's capital investment which lies idle and causes net losses to the economy. There are some cases in developed economies where ineffective industrial plants were shut down and their obsolete equipment demolished. Millions of pounds were spent recently in Great Britain to reconstruct its cotton textile industry. During this process of reconstruction many factories were closed permanently, their equipment demolished and the overall efficiency of the industry rose. From time to time the same process can be observed in the iron and steel industry of many developed countries. Though the necessity of demolishing obsolete and ineffective equipment may also arise in industries of the developing countries, the total situation there is different from that of developed countries.

First, developing countries do not suffer from the same degree of industrial over-production which may exist in developed countries. The main goal for developing countries is to increase their per capita production of almost any industrial product. The gap between a nation's needs for manufactured goods and its market demand is much wider in developing countries than in developed countries. One of the most desirable directions in filling this gap is to increase market demand (i.e. the purchasing power of the consumers) through increased production. This becomes more and more difficult because of artificial obstacles created by the market structure and certain restricted practices in the field of production,

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the wholesale and retail trade and investments which are more or less openly observed in many developing countries. Thus the criteria of efficiency which apply to the reconstruction of the manufacturing industry in developed countries cannot be applied to all developing countries.

Second, developing countries do not possess the reserves of capital funds in form of convertible currency, savings or potential equipment production which permit easy and fast reconstruction of old industries or the erection of new industries.

It is possible that under current market conditions a factory whose production is needed by a developing country becomes ineffective and has to be closed down. The problem of the criteria of economic efficiency in respect to the profitability for the individual company and the actual needs of a nation is much the same in developing and developed countries. Even in the United States some industrial projects with low profitability are considered to be of vital importance to the nation and are financially supported by public authorities. In developing countries the divergence between individual profitability and the actual needs of a nation is much greater in many fields of production.

Unless a closed factory is scheduled for demolition or complete reconstruction, its capacity, as a rule, should be included in the aggregate capacity of the industry and should be counted as excess capacity which needs to be utilized. Capacity of closed factories, being ineffective, is not included in the capacity estimations published by the Central Statistical Organization of India. So the existence of closed factories (and no factory is closed while it is efficient under the current market conditions) does not influence the officially registered rate of excess capacity. In India, however, the rate of capacity utilization of the equipment is calculated without taking capacity measurement into account. Moreover, capacity measurement is practically impossible for separate pieces of equipment which do not produce a final product or are used occasionally for different performances. Time is the natural unit of measurement of the rate of capacity utilization for this kind of equipment. There are studies which measure the exact time of operation of each piece of equipment and even analyse the idle time of the equipment during one shift. These studies, while not showing

capacity utilization as compared with output, permit to find out the average rate of capacity utilization of the enterprise. They also help to reveal the main causes of under-utilization mainly emerging within an enterprise in the field of technical, organizational or managerial inefficiencies and to show up bottlenecks and internal difficulties. This aspect of the estimation of the rate of capacity utilization can be helpful for capacity measurement of the enterprise as a whole.

Advisability of introducing multi-shift work

For fuller utilization of existing capital equipment it is necessary to study the possibilities and desirabilities of introducing shift work. Measures to be taken depend on the supply of raw material, skilled manpower, management and market demand which vary according to country and industry. But other factors being equal, multi-shift work in capital intensive industries leads to higher efficiency, cost reduction, increased gross output and a higher rate of industrial development. The possibilities of selling additional goods produced through multi-shift work on the external market should be analyzed separately for each country and each product. The introduction of multi-shift work can help to export the goods not only because of the growing volume of output, but also because of reduced production costs and a corresponding increase of their competitiveness on the world market.

From the viewpoint of the economic efficiency of production, full machine utilization is an important factor. Ideally equipment should be in operation continuously all the time after its installment until its replacement with short intervals needed for maintenance, cleaning, repair, adjustments, etc.

Switching to multi-shift operation immediately increases production and improves the utilization of capital equipment. Multi-shift operation is a major reserve for better utilization of productive capacities, especially in those industries where enterprises mainly work single shifts and only occasionally multi shifts.

Multi-shift operation is extremely profitable in many developing countries. H.J. Solomon in his study sponsored by the Indian Statistical Institute^{8/} dealt

^{8/} Better Plant Utilization in India - A Blueprint for Action, Indian Statistical Institute, 1963.

with the profitability of multi-shift operations in Indian manufacturing industries. The gain arising from introducing a second and a third shift can be substantial even if the productivity per man or machine is lower during the night shift. An additional advantage of multi-shift operation is the possibility of using electric power during the odd hours when the overall loads are lower. Multi-shift operations help to ease the power shortage in many developing countries and contribute towards fuller utilization of electric plant capacity and an increase of electric power output.

M.J. Solomon advocates a seven-day operation of manufacturing enterprises. According to his calculations the financial results to be expected from a seven-day operated modern textile mill are amazing: with an existing profit of Rs. 2.25 lakhs the introduction of one additional working day per week brings additional profit together with a substantial increase in output. M.J. Solomon states that those Indian companies that switched over to seven-day operation succeeded in solving all technical, economic and social problems arising in connexion with an uninterrupted process of production.

In June 1966 the Production Engineering Research Association of Great Britain held a special symposium on the benefits and problems of shift working. It was stated that modern high productivity and expensive (electronically controlled) equipment can be economical only if used intensively with maximum yield.

The industrialized countries are much concerned about introducing shift work in their capital intensive industries. The above-mentioned symposium of the Production Engineering Research Association of Great Britain stated that there is a direct relationship between the degree of shift working in a country and its rate of economic growth and export performance. Japan, leading the industrialized world after World War II in terms of economic growth and export expansion, and intensively using shift working is followed by Western Germany, France and the Scandinavian countries where the degree of shift working is also high. All these countries developed more rapidly after World War II than their competitors with less intensive shift working.

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The advantages of shift working are even greater for the countries faced with the problems of scarce capital, excess population and a high priority for industrialization. The experiences of the U.S.R. during 1928/1932 and of other socialist countries (Bulgaria, Hungary, Poland and Romania) during 1950/1955 (see International Review, January 1965), show that multi-shift work can solve these three problems. However, the organization of multi-shift work is not simple. Serious preparatory studies are needed to make multi-shift work a success. At the same time, multi-shift work gives to the enterprise additional advantages arising from the possibility to work the second or third shift with a reduced general staff.

The shift system is especially advantageous for capital-intensive industries and for countries with scarce capital and an abundance of labour. The shift system can be introduced when there is no problem of raw material supply and the demand for goods on domestic and world market is able to meet increased output.

Interesting data on the advantages of shift working in industrialized countries can be found in the 1951 British Census of Production. Industrial establishments with shift working represented only 6 per cent of all British manufacturing establishments, but they showed a high degree of capacity utilization. Human problems occurring in shift working are easier to settle in developing countries than in some developed countries. However, provision should be made to avoid sequences of night shifts which can impair the health of workers.

Shift working ensures a more intensive utilization of capital. Higher outputs can be achieved with the same amount of scarce capital equipment thus increasing the rate of economic growth. The same amount of capital equipment provides employment for a larger number of people. This is extremely important for over-populated countries.

The advantages of a shift system are different for industries depending on their technical equipment. There is, however, always a possibility to increase production with the same amount of equipment even for enterprises which seem to fully utilize their productive capacity on a one-shift basis.

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The technical and management personnel of second or third shifts often need not be so highly trained or experienced as the day-shift personnel. The latter usually makes the main decisions on production planning, quality control, hiring of personnel, accounting, marketing and so on. The night shift thus becomes a useful testing and training ground for personnel such as managers and foremen.

In India a substantial number of industrial firms which operated one shift have successfully switched to multi-shift operation. This is one of the reasons for the great discrepancy between statistical data on capacity and on actual production in the monthly statistics of the production of selected industries of India.

Advantages of reducing machine waiting time

In some cases better utilization of equipment may be achieved through a more economical combination of machine waiting time. The following table shows the importance of adequate organization of waiting time.

Table 19. Performance of 35 automatic machines

Status	Total time (percentage)
Machine working	43.4
Actual setting	4.4
Actual re-setting	8.6
Actual repair and maintenance	2.3
Running idle	1.9
Waiting for job	1.9
Waiting for operator	2.3
Waiting for material	0.4
Waiting for setter	3.1
Waiting for setting-tool	0.2
Waiting for setting grinding	-
Waiting for inspection after setting	1.0
Waiting for re-setter	8.2
Waiting for re-setting grinding	1.9
Waiting for inspecting after re-setting	0.8
Waiting for machine, repairman	0.4
Waiting for machine repair spares	5.8
Idle due to lack of demand	7.6
Waiting for re-setting tool	5.6

Source: M.J. Solomon, Better Plant Utilization in India - A Blueprint for Action, Indian Statistical Institute, 1963.

More than 40 per cent of the time when the machines should have been in operation they were idle waiting for resetting, repair, etc. Through efficient work scheduling machine waiting time can be reduced without any additional investments.

Many categories of machine waiting time can also be eliminated through additional training of the workers (operators, setters, re-setters) or through changes in the composition of the staff. Other technical and organizational improvements are mentioned in H.J. Solomon's study on "Better Plant Utilization in India", and in some special studies more or less known to the specialists in each corresponding industry. Experience both in developed and developing countries shows that though it is impossible to achieve 100-per-cent machine working time, one cannot determine the maximum limit of this time as a certain part of the working day - this limit is always overcome. When measuring present installed capacity of the equipment the basis can only be the actual machine working time. All improvements mentioned above should lead to the increase of capacity.

At first glance, excess capacity in the manufacturing industry of developing countries seems to be a major reserve of production for export. If it becomes possible to use this excess capacity for producing manufactured goods for export, two of the great problems of industrialization will be easier to solve. First, the higher rate of capacity utilization will increase the possibilities for economic development. Second, the export of additional manufactured goods will ease the lack of foreign exchange and increase imports of equipment necessary for the economic progress of these countries. But the utilization of excess capacity for export is not an easy and simple task. Not all excess capacity can be utilized for this purpose. Development of production for export demands the adoption of a series of complicated measures in the production sector (improvement of quality and management, reduction of costs, introduction of world-wide recognized standardisations, export trade promotion, etc.).

Multi-shift operation always increases the efficiency of equipment utilization. But before taking a decision on introducing multi-shift work the advantages and limitations of this step should be reviewed first.

The following data are necessary for calculating the economic efficiency of introducing multi-shift work: (1) the maintenance costs of equipment and the rate of amortization for fixed assets per unit of output on multi-shift work as compared with one-shift work (depending on technological conditions the ratio may be 1 or more or less), (2) labour costs taking into account higher wages for night work; (3) cost of raw material, power, etc. per unit of production; (4) overhead costs per unit production; (5) increase of the rate of growth of output and of value added as the result of switching to multi-shift work; (6) shortening of the time of recoupment of fixed assets and possibilities of faster replacement of installed equipment by modern and more efficient machinery taking into account the interest rate on capital invested.

In addition to these financial data the following factors should also be evaluated: (a) demand for the additional product and export possibilities and (b) availability of additional manpower and material supply (including purchase of supply from abroad).

All this information is not easily obtainable from regular statistical publications. It is therefore necessary to work out recommendations for the inclusion of additional data into these publications. A series of special studies (including case studies) on multi-shift operation in selected developing countries would also help to increase the sources of information.

In cases where installed capacity is measured on a one-shift basis but production is organized on a multi-shift basis, the comparison of data on capacity with those on production does not give any information on the rate of capacity utilization. In order to estimate the actual rate of capacity utilization, officially published data on capacity have to be compared with the output produced during each shift. This information, however, is rarely available on a national scale, whereas it is not difficult to make the corresponding calculations for individual enterprises.

Flexible control over import and foreign investments

When the domestic market is not large enough to permit full capacity utilization, the competition of foreign goods imported into the country and of foreign enterprises acting in the country can prove harmful.

Despite their high rates of capacity under-utilization developing countries continue to import goods which could be substituted by products gained from excess capacity. For instance the import of textiles by Latin American countries is substantial (Ecuador - over \$5 million per year, Argentina - \$30 to \$40 million, Columbia - about \$7 million, Chile - about 90 million pesos, etc); at the same time, their own textile industry is under-utilized. Not being in a position to utilize their capacity, owing to severe competition of imported goods, the industry of developing countries cannot always take part in this competition due to their low rate of capacity utilization. This vicious circle can be broken only through fuller utilization of the productive capacity and by deliberate curtailment of imports of competitive foreign goods. Governments and economic planning agencies of developing countries can regulate their foreign trade which influences the rate of capacity utilization in these countries in many ways.

Foreign companies often erect enterprises in developing countries which are not of vital importance to the economy of these countries, or which at least have a higher productive capacity than needed. Thus industrial structure of foreign investments is not always favourable for a fast industrialization of developing countries. For example, the main part of private investments made by American companies in the engineering industry of Latin American countries (Brazil, Argentina, Mexico and Uruguay) is directed into the motor industry and industries producing durable household goods (electrical appliances, radio and television sets, etc.). The result is that these countries experience an acute shortage of capital for the most important industries, needed for their industrialization, and have a significant excess capacity in the above listed industries which are of secondary importance to their economy.

Private foreign capital has been invested into textile industries (which utilizes about 50 per cent of its capacity or less in Ecuador, 60 to 80 per cent in Argentina (1961/64), about 50 per cent in Venezuela, etc.), into processing of agricultural products and the petroleum industries. When investing capital into the industry of developing countries, foreign companies do not follow the national interest of these countries, but seek the most profitable outlets for their resources. Therefore enterprises built by foreign companies are as a rule highly

and re-utilized and divert scarce raw materials and skilled labour from other industries which could be more gainfully used for the national economy. Governments and economic planning agencies should therefore exert their influence to diminish this harmful effect of foreign investments upon the industrialization of developing countries.

Improvement in economic planning

The necessity of planning economic development and industrialization is universally recognized. But at present neither long-term nor short-term economic planning includes provisions for improving the rate of capacity utilization. It is recommended to introduce capacity evaluation into the first stage of planning formulation and to consider all necessary steps to increase the rate of the existing capacity utilization before establishing new capacities of the same type.

Capacity utilization can much more easily be carried out on state-owned than on private enterprises. The enterprises whose capacity cannot be reasonably utilized on the private basis may show more efficient performance if placed under public control, management or ownership. Only a national system of economic planning can properly co-ordinate the activities of different but closely inter-connected economic spheres and determine the possibilities of capacity utilization, including capital investment, supply of raw material, labour training, external economic relations, domestic demand, credit system, marketing abroad, and so on. UNIDO in co-operation with other United Nations agencies should assist developing countries to improve economic planning for better capacity utilization.

Need for expert marketing

Because of inadequate organization of marketing abroad, some countries failed to develop their exports and to increase their rate of capacity utilization. Marketing without the necessary experience, specialists and currency resources, may become a costly undertaking for the smaller developing countries. By organizing seminars, training courses and international meetings and by supplying a marketing expert service UNIDO can assist these countries in their attempts to utilize excess capacity and to increase exports of manufactured goods.

Other measures

(a) More efficient and profitable utilization of capacity (including excess capacity and export capacity) may result from switching the use of equipment from the production of one product to another. The two main difficulties of this process are: (1) to gain a clear picture of the direction of the switch and to convince the responsible people of its desirability; (2) to establish an effective administrative body for carrying out this switch. The main functions of this body should be performed by some public authority using both economic incentives and compulsory measures.

A company with an export order which it cannot meet owing to lack of equipment should be able to use the excess capacity of other companies (if the equipment of the latter can be used for the production of the corresponding product). Such a capacity exchange should be regulated by this special administrative body, provided either by the government or an industrial association. The system of sub-contracting can be widely used to meet these ends.

(b) In some cases capacity utilization could be increased through a more diversified production (especially in the iron and steel industry - diversification of rolling mills) by using local raw materials and intermediate products. Diversification in raw material production should be encouraged in order to supply local manufacturers with the most appropriate materials. This would not only lead to an increase in capacity utilization but also to higher rates of export due to higher efficiency, reduction of costs and use of local rather than imported material.

(c) Export products using indigenous materials rather than imported materials should be given top priority. No restrictions should be applied to these types of industries. At this stage in India's economy excess industrial capacity should not be discouraged as it is needed to stimulate market efforts.

In planning foreign trade and expenditures for import developing countries should first of all provide the necessary resources for buying maintenance imports in order to avoid under-utilization of industrial capacity because of lack of spare parts, components, balancing equipment as well as auxiliary materials and scarce

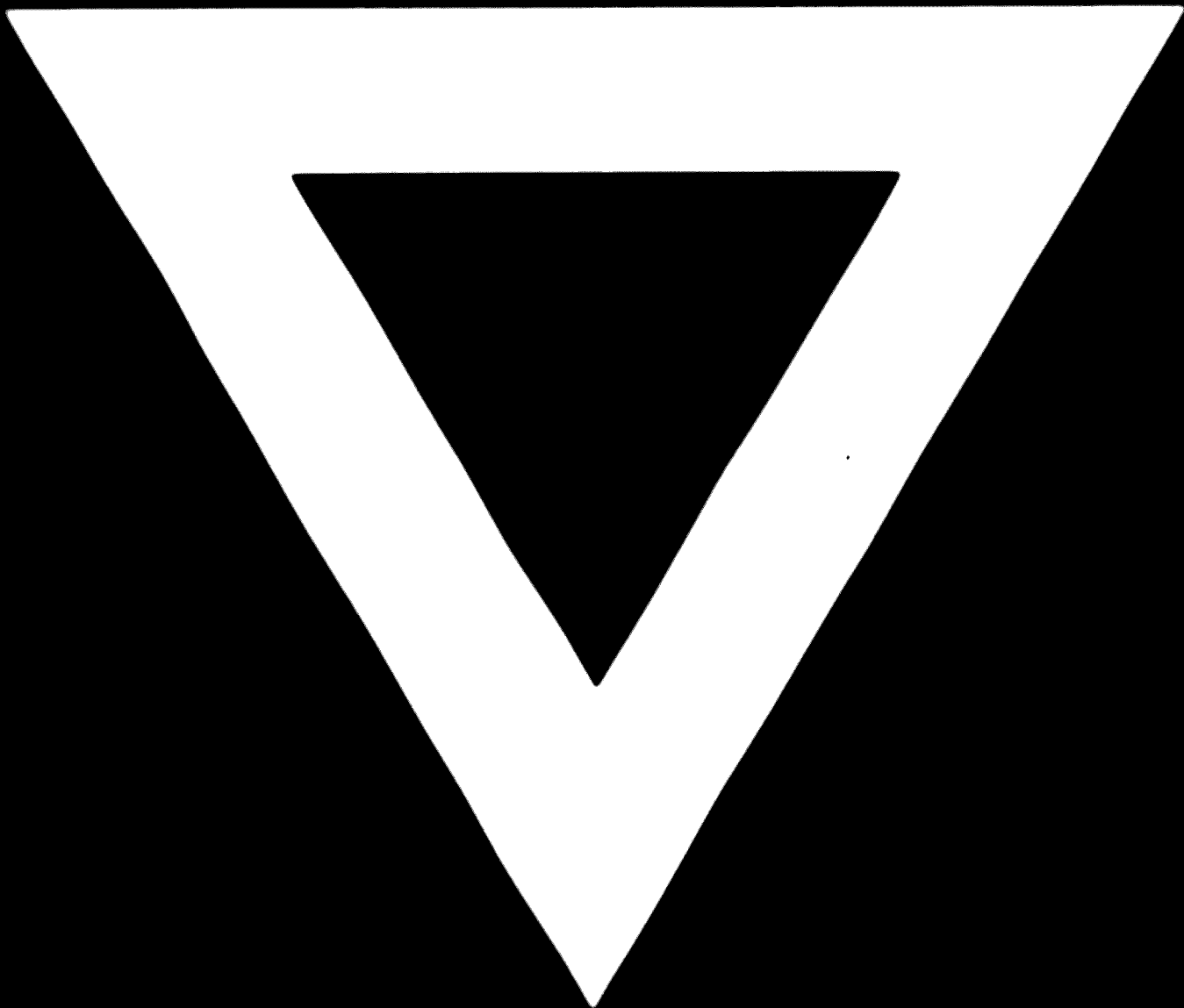
(c) This paper is only the first step towards studying the problem of industrial excess capacity and its utilization for export. We plan to continue the work in this field in a more practical way. Having completed the initial study on the main problems concerning the utilization of manufacturing capacity in developing countries for exports, the right time has come to offer technical assistance to these countries. For this purpose, upon receipt of government requests exports should be sent to relevant developing countries in order to analyse the actual degree of all the reasons for capacity under-utilization in the industrial enterprises. It is necessary to study the market demand (both domestic and external) and the possibilities for increasing sales, and to recommend detailed technical, managerial and marketing measures. Detailed lists of recommendations for the better use of installed capacity for export production should be presented to governments, industrial organizations and international agencies.

The results of this investigation together with other studies still to be commissioned should be discussed at a meeting of experts. The aim of this meeting should be to work out recommendations for the utilization of excess capacity for export. These recommendations should deal with the following questions:

- (1) methods of capacity measurement;
- (2) standardization of national statistics on capacity and capacity utilization;
- (3) analyses of the main causes of capacity under-utilization;
- (4) measures to be taken to achieve better utilization of capacity through export promotion; and
- (5) the planning of further studies of this problem.

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