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

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WORLD MARKET OF ALUMINIUM METAL AND SEMI-FINISHED PRODUCTS: QUALITY ASPECTS, CONDITIONS AND PROBLEMS WITH AN IMPACT ON DEMAND (INTERNAL AND FOR EXPORT)*

by

A. Mersich**

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** Commercial Director, METALIMPEX, Budapest, Hungary.

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1. The world market of aluminium metal /production, export and import data/.

Aluminium is showing the most dynamic progress of all the major metals. 5o years ago, in 1927 some 22o thousand metric tons were produced of aluminium, in the same year crude steel made 9o million tons, copper 1.5oo th tons, zinc 1.318 th tons, lead 1.673 th tons. No other metal has passed the one million ton yearly production. Since 1927 the production of these metale was, as follows /in th tons, steel in million tons/.

	Aluminium	Crude Steel	Copper	Zinc	Lead
1937	493	abt 13o	2.564	1.636	1.697
1943	1.949	145,o	3,o23	1.83o	1.482
195o	1.5o7	187.o	3.187	2.o6o	1.85o
196o	4.543	343.4	4.998	3.151	2.717
197o	1o.257	588,3	7.583	5.23o	3.983
1976	13.o83	683.5	8.831	5.8o6	4.112
1977(prov.)	14.169	673.1	9.100	5.900	4.700

Aluminium possesses certain excellent properties, to which this steep rise was mainly due. Firstly, of the major metals aluminium can be found in the relatively highest quantity in the earth crust: 8.1%. Iron makes 5%, zinc o.1o, copper o.o7, lead o.o2%. There ie such an abundance of aluminium carrying ores that mankind need not bother about its availability in the future either. The problem is how to process it to metal economically.

Secondly, there is the specific weight. Metals are divided according to their specific weights in two groups: heavy and light metals, the latter weighing less than 3 kilos per litre. Aluminium with its specific weight of 2.7 kg/l is roughly 1/3 as compared with the weight of steel or copper and 4o% of zinc. Mankind could not fly without the application of aluminium. In roofing equal weight of aluminium covers the treble surface that copper or steel sheets would. There is a tremendous saving of fuel by using aluminium in vehicles instead of heavy metals /steel, zinc/. If measured in a cube, the volume of aluminium yearly produced is more, than all the non-ferrous metals put together.

The third advantage of aluminium lies in its good corrosion resistance, including resistance to most organic acids in foodstuffs. Steel can be produced much cheaper than the non-ferrous metals, so that these latter can only compete with steel if they procure something what steel cannot.

The main vulnerability of ordinary steel is its poor resistance to corrosion. Therefore, the pleasant metallic lustre of aluminium opened excellent possibilities not only in the field of constructions, housing, etc but also in packaging and household goods /pottery, etc/ since next to tin and stainless steel aluminium is the mostly used metal because of its resistance to organic acids in food.

As afourth characteristic, mention should be made of the electric conductivity of the metal. The classical conductor, annealed copper wire put at 100%, silver is put at 106% /best conductor, but much too expensive/, hard drawn copper 90%, pure aluminium 61 %, alloyed 45/50%. By a combination of lower price per ton and of the difference in the specific weights, aluminium has made a big stride as an electric conductor, in replacement of copper, the main use of the latter is just on this field. Free-air, high-voltage overhead conductors are since World War II. practically exclusively made of aluminium. /On the other hand, thin wires, transformers, electric motors and low voltage use in general is left to copper./

The metal smelt from ore is called "virgin" or primary, a distinction against metal gained from recycling /secondary/. Aluminium in the smelter is assaying usually min 99.5% or 99.7% purity /the main contaminations are silicon and iron/. Electro conductive metal should have silicon below 0.10%. The strength of aluminium is raised by adding magnesium and/or manganese. By alloying copper very high tensile strength can be attained. The casting properties are improved by adding silicon between 5/25%. In small quantities also other alloying elements may be added or tolerated. The shapes cast in the smelter are ingots /weighing 5-15 kilos, or more/, T-bars /may weigh one ton or more/, billets and slabs for direct use in extrusion shop or rolling mill.

The progress of yearly world aluminium production since 1960 is shown below, in th tons, change in % compared to the previous year.

1960	4,543,0	+10.8%	1966	7,208,7	+9,5%	1972	11,649,0	+6,5%
1961	4,555,7	+ 0.7%	1967	7,933,8	+10,1%	1973	12,707,3	+9,1%
1962	4,956,9	+ 8,8%	1968	8,515,0	+7.3%	1974	13,808,7	+8,7%
1963	5,400,8	+ 9,0%	1969	9,459,3	+11,1%	1975	12,699,3	-8,0%
1964	6,054,9	+12,1%	1970	10,256,9	+ 8,4%	1976	13,083,0	+2,8%
1965	6,586,1	+ 8,8%	1971	10,936,0	+ 6,6%	1977	[illegible]	[illegible]

In 1974 there was a great decrease in the demand for metals. In the Case of steel, copper and zinc one can see this fall back even now in the actual price levels and consumption figures.

and also in the quantity of surplus stocks. We will revert to this when coming to the demand. We note already here, however, that aluminium mastered this situation far better than the metals mentioned.

According to all prognoses the yearly growth rate will stay in the range of 5-7%. In 1976 virgin aluminium was produced in 4o countries, lo years earlier it was produced only in 30 countries. - Many people ascribe the present recession in steel to the fact that in 20 years the number of steel producing countries has grown from 32 to 71. The increase of aluminium producers did not depress the market, since there was enough demand to absorb the same.

The world production of virgin aluminium by countries in 1976 was the following (in thousand tons).

	Germany F. R.	697,1
	France	385,1
	Italy	2o6,5
	Netherland	248,9
	U.K.	334,5
	Norway	62o,9
	Greece	134,o
	Iceland	65,3
	Yugoslavia	197,7
	Austria	88,7
	Sweden	81,4
	Switzerland	78,2
	Spain	2o9,o
Western Europe		3.347,3
	Bahrain	122,1
	India	211,8
	Iran	3o,6
	Japan	919,4
	Korea, South	17,6
	Taiwan	25,7
	Turkey	37,4
Asia		1.364,6
	Egypt	59,o
	Ghana	151,1
	Cameroon	48,7
	South Africa	78,4
Africa		337,2
	U.S.A.	3,856,8
	Argentina	43,1
	Brasil	139,2
	Canada	633,4
	Mexico	42,4
	Surinam	44,8
	Venezuela	46,5
America		4.8o6,2
	Australia	231,3
	New Zealand	139,8
Australia & Oceania		371,1
	USSR	2,2oo,o
	G D R	6o,o
	Poland	1o3,o
	Rumania	2o7,o
	Czechoslov.	36,o
	Hungary	7o,5
	China	18o,o
Centrally planned economies		2.856,5
World total		13,o82,9

/Source: Metallgesellschaft/

This does not reflect the smelter capacities in the different countries, which was actually 15,6 million tons. In 1974 the world production of virgin aluminium was 13,6 million tons. In 1976 the USA produced 6oo th tons, Canada 4oo and Japan 2oo th tons less than two years earlier. This was a consequence of the general decrease in the demand for metals owing to the economic recession.

Please see below the primary aluminium (also alloyed) export and import of some countries for the year 1974, when production was at nearly full capacity. The countries are grouped as net exporters or importers of the metal /also considering the foreign trading in semi-finished products/. The table is by far not complete, yet with the exception of the People,s Republic of China it includes all the major importers and exporters (thousand tons).

	Export	Import		Export	Import
Net exporters			Net importers		/x/
Canada	681,3		U.S.A.	188,5	461,3
U.S.S.R.	528,7		U.K.	86,9	280,7
Norway	404,2	21,7	Germany FR	119,8	338,1
Greece	101,8		France	179,8	262,9
Yugoslavia	66,7	48,9	Sweden	6,7	54,3
Netherlands	294,0	158,6	Belgium/Luxemb.	7,2	166,8
			Italy	23,3	256,0
			Japan	24,2	384,8
			Switzerland	23,1	41,6

/x/of this 37o th tons from Canada.

2. The supply situation of aluminium on the world market.

As it becomes obvious from the list of aluminium producing countries, the leading producers have a rather small supply of bauxite, if any, from domestic resources. You have dealt extensively with the world bauxite and alumina picture, so that it suffices to state that the classical producers of aluminium of North America /U.S.A. Canada/ and West-Europe /France, Germany, Norway/ as well as those leading industrial countries, who joined later: Japan, USSR, U.K., the Netherlands, Italy, etc, have based their smelters on local energy and on the proximity of users.

By far, not all of them have an abundance of hydropower, which since the beginning looked the most economic source of energy supply. Yet of the leading producers the Canadian, Norwegian and most of the Soviet aluminium smelting was always based on hydropower. The United States have made beside waterpower extensive use of natural gas. The Netherlands and Bahrain have also based their smelting on natural gas and there is a number of ambitious projects to exploit domestic oil and gas for the construction and operation of smelters in oil-rich countries.

Yet coal is by far not negligible, as energy carrier, since most of the medium and small size producers gain electricity from coal. It is previsible that before the end of the century the share of nuclear energy will considerably rise. Only France has a sufficent domestic bauxite basis of the great producers. But a number of medium-size producers are also able to fully supply their smelters with local ore and alumina, like Brazil, India, Ghana, Yugoslavia, Greece, China P.R., Romania, Australia, Hungary , etc.

It can be stated, therefore, that aluminium smelting was more extensively based on the availability of energy and on the proximity of demand, than on the abundance of ore, inspite of the not always cheap transport costs of bauxite and alumina. /On the other hand, bauxite is processed on the spot to alumina in a constantly growing proportion./

Aluminium metal can "much better travel" as regards freight compared to the value of metal. Although it is a "light" metal, one cubic meter weighing 2,7 tons, aluminium can economically be transported. /The ingots are bundled, usually weighing about one ton, but just for easy transport also big "pigs" called T-bars and weighing half to two tons, are becoming more popular.)

Aluminium is extensively transported from one continent to the other e.g. Hungarian aluminium goes to Japan in containers on the Trans-Siberian route at a cost of 80 $/ton, by ship from Hamburg to China at 50-60 $. These make roughly 5-7% of the goods, value. - Very often continental /rail or truck/ transport is much more costly than by sea to overseas.

In respect of government import policy it has to be said that just because of the fact that many countries produce the metal in sufficient - or nearly sufficient - quantities, it is not a rarity to meet obstacles. The Common Market /EEC/ employs an import duty of 7% on raw aluminium towards outsiders /non-associated countries/. In the United States the import duty levied on virgin aluminium is 1 ¢/lb for "most favoured nations" and 4 ¢/lb for those lacking MFN. - Import duty is often combined with import quotas in a sense that "duty free quota" is allocated to a certain producer country, like in the case of Norway to the markets of the UK and Germany.

Recycling is of great importance, since the virgin metal represents presently a value of 1.000 - 1.100 $ per ton. It must be noted that secondary aluminium /usually scrap/ can only be reused in the process if it is sufficiently free from dirt and its alloy is clearly stated. Great care is taken, therefore, to properly separate and store the scraps at the processing of semis to finished products /clean cuttings and turnings are usually taken back by the rolling mill or extrusion works/. Old scraps are sorted by the scrap collectors and are usually used in foundries.

Secondary metal can be refined through three-layer electrolysis to super purity metal of a minimum of 99,95 % Al. This process is, however, as costly and energy-consuming as the production of virgin metal itself.

Recycling of aluminium was 3.1 million tons in 1976,/excluding countries with centrally planned economies/.
The major countries using the recycling method were:

Germany F.R.	345 th tons
U.S.A.	1.312 th tons
France	137 th tons
Italy	198 th tons
U.K.	238 th tons
Japan	526 th tons

This tonnage means round 30% of the primary metal output and represents the basis for the aluminium foundries. /Some pure aluminium has to be added, too./ New production scraps from first users are usually sent back to the semi manufacturers.

3 Demand for aluminium on the world market

The consumption of primary aluminium by countries in 1976 was the following. (In thousand tons)

Germany F.R.	954,4	Hongkong	21,8
Belgium/Luxemb	244,o	India	17o,o
France	492,6	Iran	36,2
Italy	365,o	Israel	14,9
Netherlands	1o5,5	Japan	1,488,4
U.K.	444,5	Korea Rep.	41,9
Norway	113,6	Lebanon	2,7
Finland	28,5	Malaysia	7,6
Greece	51,o	Philippines	14,3
Yugoslavia	14o,o	Taiwan	48,6
Austria	1o6,6	Thailand	13,6
Sweden	114,9	Turkey	68,6
Switzerland	1o4,6	other Asia	25,2
Spain	222.5	Asia	1,953,8
other Europe	20,4		
Western Europe	3.5o8,4	U.S.S.R.	1,69o,o
U.S.A.	4,434,9	Bulgaria	4o,o
Argentina	56,7	German DR	21o,o
Brasil	217,9	Poland	145,o
Colombia	1o,o	Romania	95,o
Canada	35o,5	Czechosl.	158,o
Mexico	45,o	Hungary	175,o
Venezuela	44,9	China PR	35o,o
other America	1o,3	other East-Asia	22,o
America	5,182,9	Cuba	1,o
		Centrally planned economies	2,886,o
Egypt	2o,o		
Cameroon	31,6	Australia	168,4
Rp of South Afr.	66,6	New Zealand	22,4
other Africa	25,2	Australia & Oceania	19o,8
Africa	14o,1		
		World total:	13,862,o

/Source: Metallgesellschaft/

It is worth having a look at the consumption figures of the main non-ferrous metals /primary and refined/ since 1973 /for the sake of comparison 1969 is also included, as the peak of the last preceding boom/.

	Aluminium	Index	Copper	Index	Zinc	Index	Lead	Index
1969	9,651,5	7o,89	7,136,3	81,52	5,116,3	82,33	3,837,4	86,4o
1973	13,615,3	1oo%	8,753,7	1oo%	6,214,4	1oo,o	4,441,4	1oo,o
1974	13,877,6	1o1,9	8,3o3,8	94,86	5,968,1	96,o4	4,391,3	98,87
1975	11,341,1	83,2o	7,46o,3	85,22	5,o35,2	81,o2	3,913,2	88,11
1976	13,862,o	1o1,81	8,5o9,o	97,2o	5,723,9	92,11	4,283,1	96,44

This table shows convincingly the strength of aluminium demand against the other leading metals. /The same applies to steel versus aluminium./ Whilst none of the leading metals have regained the consumption level of 1973, aluminium has surpassed it.

The same trend is reflected in the price of metals. Before comparing aluminium to the others, it should be noted that there are two quotations of aluminium, which are regarded worldwide as most important gauges for international trading.

One is the world export price of the Canadian company Alcan for 99.5% virgin ingots quoted in U.S. cents per pound, for all main world ports excl. USA, Canada, U.K. and since 1974 also South America. Since 1973 this quotation was

until	12.6 1973	25 ¢/lb	from	2.7.1974	39,o
from	13.6.	27,9 ""	from	1.3.1976	43,o
	21,9	3o,o ""		1.8.	48,o
	21.2 1974	33.o ""		1.4.1977	51,o
	31.3.	36,o			

Next to this big producer,s "official" price is of importance the quotation published in the London Metal Bulletin under the heading "certain other transactions" cif Europe. /We will come to questions of "free market" later / Since the Metal Bulletin quote may change two times a week, overleaf we quote the quarterly averages. With a view to the fact that the overwhelming part of these transactions is also made in U.S. dollars, the currency was changed with effect from July 1975 to US dollars.

	1973		1974		1975		1976		1977
1.q.	195	-2oo £	393	-398 £	282	-295£	359	-372£	962-978$
2.q.	232	-235	451	-46o	233	-292	467	-483	1o27-1o44
3.q.	267	-293	424	-435	329	-339	949	-972$	1oo9-1o26
4.q.	356	-362	323	-342	325	-336	874	-9oo	931 -962
Average	267,66-272,66£		398,o-4o3,98£		3o5,o6-315,o2£		412,88-427,o5£ 911,93-936,o2$		982-999,- $

Very hectic variations, indeed! From November 1973 for 12 months the price showed the consequences **and the uncertainties of** the energy crisis. Yet when in most countries the price of electricity became substantially raised, the aluminium price **fell** markedly, because of the slump. After a year of relative calm at such a low level, which certainly did not cover the production costs of the smelters, not to speak o a cover for new investments or necessary expenses **for older smelters** to catch up with regulations now prevailing for protection of the environment.

But copper and zinc did even worse in the same period, because they could by far not follow the relative recovery of aluminium in 1976 and 1977. The volatility of the prices of "heavy" metals is showed here, in the light of the London Metal Exchange quotation.

	L. Copper fire-bars £			G.O.B. Zinc 98% £			Refined Lead, min 99,97% £		
year	**average**	lowest	highest						
1973	727,1o	446	1135	364,7o	16o,2o	93o,o	179,o8	13o,5o	33o,o
1974	877,63	588,5o	1466	528,13	3oo,o	87o,o	268,8o	214,o	324,o
1975	956,95	497,5o	626	335,3o	294,o	363,o	185,88	142,5o	23o,o
1976	78o,56	574,5o	937	394,36	333,o	491,5o	249,82	163,o	3o2,o
1977	75o,29	628,5o	9o3,o	33o,12	27o,oo	44o,o	3o4,11	3o1,5o	43o,o

A real "drama" has taken place in copper when from end of May 1974 the price of 1400 £ fell below 700 £ within 3 months, and owing to enormous world stocks, copper was unable to seriously recover since. In fact, many experts envisage a pressure on the price of copper as far ahead as 1981, owing to oversupply and the big accumulated stocks, which amount to about 2 1/2 million tons and did not decrease in 1977 at all. 1 1/2 million tons of it are put on the London and New York /Comex/ Metal Exchange stocks. Almost no mine production is going on in the United States at present, since the current price of copper does not cover the production costs. CIPEC was unable so far to make Chile agree to a general voluntary production cut of 10% /together with Zambia, Zaire and Peru/.

Statistically zinc saw an even bigger rise and fall in price in 1973/74. This was due to the closure and dismantling of about 1.5 million tons of smelter capacity in the United States for pollution reasons. It should be noted, however, that at that time 60% or more of the consumers were supplied at the official producer price which was independent of the Metal exchange excessive fluctuations and kept in the range of 300-400 £.

We can see from the table that lead has kept surprisingly well in the years since 1973. The first reason for this is that lead started at a very low price level, if compared with other metals /mainly zinc/ on long term. Lead recovered then much better - and also its present prospects are brighter, - than either of copper or zinc. All this is due to the increased car production worldwide /batteries mainly/ and since a number of old smelters are gradually disappearing because they cannot comply with the new regulations concerning pollution.

Aluminium has apparently recovered the recess of 1975 and excluding the possibility of an unexpected, general recession in the leading western industrialized countries a steady increase in consumption can be expected. Even with a rate of expansion of 3% in the OECD countries, employing the old "rule of thumb" according to which the growth of aluminium is 2% higher than the general rise of the economy, we arrive at 5% average growth rate. This figure is certainly not exaggerated, taking in view the 7% average of the last two decades /and much higher rates before/.

It is envisaged, on the other side of the picture, that because new investments of aluminium smelters have generally gone back in the last years, a relative shortage of aluminium will occur around 1980. The stocks of aluminium have decreased in the 8 months of 1976 and first half 1977 by 1 million tons from the earlier 3 million tons. In the meantime the utilisation of capacity reached 86% at the end of 1977.

Discounting routine maintenance and smaller break-downs in the operation, the world aluminium smelter capacity is near to full exploitation.

What is highly probable regarding the price trend is a further relatively modest rise in the next future, giving place to much more drastic changes upwards later on.

It is worthwhile to have a look at the growth of per capita consumption of aluminium in a number of industrialized countries, by comparing 1955 with 1976.

	1955	1976
U.K.	6,8 kg	13,o kg
Austria	4,7	1o,6
Belgium/Luxemb.	1,8	11,o
Denmark	2,o	11,3
France	2,9	12,o
Holland	3,4	13,2
Japan	o,5	15,6
Canada	5,1	13,2
Norway	4,5	24,o
Germany F.R.	4,6	19,3
Italy	1,7	9,6
Spain	n.a.	7,o
Switzerland	5,8	12,7
Sweden	4,9	19,3
U.S.A.	11,4	25,9

With econometric methods a rather clear correlation can be established between the per capita GNP and the consumption of aluminium. In consequence of the greatly accelerated rate of inflation of many leading currencies in the last years - and also connected with the general float of currencies at present, - no approximate "formula" may be quoted.

Hungary is relatively poor in mineral wealth, with the exception of bauxite. This is the reason why since four decades great efforts have been made to concentrate on the usage of metal possibly on aluminium. We can say with satisfaction that Hungary has achieved really much in this respect.

4.1. Integrated character and structure of the aluminium industry.

The world aluminium smelter capacity was estimated at 15,8 million tons in 1977. 6,837 th tons of this were owned /in proportion of their share in the individual units/ by 6 international aluminium companies.

Aluminium Co. of America, Alcoa owned 1419 th tons smelter capacity in the U.S.A., 72 in Suriname, 27 in Mexico, 3o in Brazil, 46 in Australia, 75 in Norway, total 1,669 th tons.
Alcan Aluminium Ltd, Alcan owned in Canada 968 /by now 1,12o/, Brazil 57, Japan 193, India 67, Australia 35, Spain 36, Norway 8o, U.K. 12o, total 1,556 th tons.
Reynolds Metals Co., U.S.A. 89o, Canada 135, Venezuela 62, Iran 7, Ghana 15, U.K. 63, total 1,172 th tons.
Kaiser Aluminum and Chemical Corp. in the U.S.A. 669, India 26, Bahrein 2o, Australia 45, New Zealand 33, Ghana 135, German F.R. 4o, U.K. 66, total 1,o34 th tons.
Pechiney/Ugine Kuhlmann /P.U.K./ France 416, Netherlands 145, Greece 15o, U.S.A. 1oo, Spain 66, Cameroon 6o, South Korea 8, total 945 th tons.
Alusuisse, Switzerland 9o, German F.R. 185, Norway 56, Italy 24, Iceland 76, Austria 12, South Africa 18, in total 461 th tons.

Also the governments of the different countries recognized the importance of aluminium and 5,276 th tons of the world smelter capacity was state-owned in 1977, with the following break-down: Countries with centrally planned economy: U.S.S.R. 2,41o th tons, Rumania 2oo, Poland 2oo, Yugoslavia 17o, China P.R. 25o, German D.R. 84, Czechoslovakia 6o, Hungary 75 /total 3,489 th tons./ Other countries: German F.R. 339 /V.A. W./, Italy 252, Spain 1o6, India 11o, Egypt 1oo, Bahrain 86, Taiwan 9o, Iran 43, Turkey 6o, South Korea 8, Argentine 9o, Brazil 5o, Venezuela 62, /total 1,787 tons/.

The four big North American companies and mainly Alcoa and Alcan, who enjoyed a monopolistic position ir their respective countries before the second world war, were from the very beginning out for acquiring capital share in bauxite mines of other countries /at first in the Carribean Sea, then in Africa, finally as far as Australia./ The same applied to alumina factories. In this way the North American "big four" had a majority share in the bauxite supplying mines and alumina factories in the 196os.

The situation was different with Pechiney, insofar as the French could rely on domestic bauxite. In fact, the integration in France is going so far as to include within P.U.K. from bauxite to semi-finished products(Cegedur, etc), practically the whole aluminium industry of France.

After the second world war, with the rocket-like growth of smelting and processing of aluminium, the big companies realised that they should not only possess the bauxite/alumina side, as raw material basis of their aluminium production but in order to obtain profit return for the metal, they should also get a correspondingly high proportion of the semi-manufacturing plants, as captive market for the ingots.

It would go too far to analyse here the capital share of all the big international companies in detail from bauxite to semis. It should suffice to point out Pechiney as an example of integrated aluminium company. Not only does P.U.K. hold in possession the total French production from bauxite to semi-finished goods but its foreign investments capture important market shares in half a dozen foreign countries as well, beside the former French part of North and Equatorial Africa.

The bauxite and alumina interests of Pechiney you have been acquainted with on preceding lectures. As we have mentioned earlier, P.U.K. groups total aluminium smelter share made 945 thousand tons, of whith 416 thousand tons were in France. The rest is located in 6 other countries /see page 12 /. By the way, the first smelter in Africa was established by Pechiney in Cameroon. - As regards semi manufacturing, P.U.K. have the following shares of participation abroad, apart from practically possessing with exclusivity the French domestic manufacture: T.L.M. Italy 64%, B. and E. Kaye, U.K. 100%, SIDAL Belgium 38%, CAMEA Argentina 65 %, N.M.A. Morocco 62 %, SOCATMAL Cameroon 53 %, Howmet USA 56 %, Aluminio de Galicia, Spain 68 %.

4.2. Free market of aluminium.

Similarly to nickel, in which metal Canada had for decades an overwhelming share of the world supply and in which metal the International Nickel Company,s /INCO/ "posted" producer price was not changed for years, even for decades, the aluminium ingot price announced by the big four North American producers showed on the surface a stability, which could not be compared with the liveliness of prices of the "heavy metals" on the London Metal Exchange, which was re-opened in 1953. The producer price, often referred to as the "official" price of aluminium ingots was practically unchanged for each two years 1958/59, 1960/61, 1962/63, or even 3 years of 1965/67. It is obvious that such an immobility of a metal price is artificial and does not reflect the true movements of the international market.

Whilst the integrated rolling and extrusion works or casting shops were obliged to pay for ingots the "official" price of the mother company, the real fight was taking place, when selling their produce. This is, where integration ended and the forces of "free market" came into operation. The rolling mills tried to protect their economy by acquiring offers from non-integrated aluminium producers or from merchants holding such metal and used these as an instrument to get a price below the "official" ingot quotation of the parent company.
Another method practised by the smelters officially maintaining posted prices is to grant "fidelty rebate" to long-term buyers /or even to new-comers/, to grant interest-free credits, store in user,s plant ingots "in commission", etc.

As early as 1938 has the London "Metal Bulletin" commenced the publication of the price of virgin aluminium 99.5% /later also 99.7%/ emanating from "other sources". Later the heading was changed to "certain other transactions" and with July 1976 the currency from £ St. to U.S. dollars. This quotation is moving usually with a smaller or bigger difference /"discount"/ below the "official" quote of Alcan world export price. It has occurred only two times since 2o years, even then for short periods that the free market price surpassed the producers' price, namely in 1969/7o and 1973/74.

The reason, why the free market price is lower than the "official" is that the integrated concerns try to exploit an optimum price for the ingot from their own processing plants, whilst when selling to outsiders they are only too flexible in granting concessions.

The free market turn-over is presently estimated at 5oo-6oo th tons per annum. The biggest single buyer is the People,s Republic of China with yearly 1oo - 2oo th tons, some times even more. The two Canton fairs /in the spring and autumn/ used to attract many of metal merchants and also producers and the price level agreed upon /and the tonnage sold/ in Canton have an influence on the market for some time thereafter as well. In any case, also the Chinese buyers have changed their purchase methods during the years and lately the Chinese purchase delegations visit in turn West Europe and Japan to procure for a good part of the purchases, which were sooner done almost exclusively in Canton.

International merchant companies are holding possession of a growing part of physical metal coming to the free market and thus the speculative element has greatly grown also in

aluminium in the last years. /It is generally known that copper is by example subject to speculation by the most different parties on the exchange, as a currency hedge as well, as popular object of investment trust, .../

Extensive "swap" operations have also became a fashion lately, by which holders of aluminium in the different parts of world can save substantial freights by swapping their "positions". - Because of the high import duty in the EEC and also in view of import licencing considerations in the last months a separate market is developing for customs-cleared aluminium ingots in the EEC countries.

4.3. Aluminium on the London Metal Exchange?

The ever-increasing quantities of aluminium coming to the free-market and the variety of operations, which are very often most attractive also to the big aluminium producers, the chances of introducing aluminium to the London Metal Exchange /LME/ have greatly increased lately. In fact, this subject is not only widely discussed but the LME has a subcommission dealing with this.

Let us have a brief look at the characteristics of the metal exchange against the regime of producer price fixation.
a./ All the major non-ferrous metals are quoted two times daily on the LME, except aluminium /copper, lead, zinc, tin, silver/. - It is supposed that shortly after aluminium also nickel will enter.
b./ The LME quotation is the generally recognised price of the metal not only in ingots, but beginning from ore/concentrate to the semifinished/finished product. It is a general practice to agree on unknown price, i.e. upon a metal price as quoted on the LME in an agreed future period, with a fixed returning charge /R/C/ for ores/concentrates, resp. transformation charge for a higher processed product /semifinished, cables, etc./.
c./ As one of the most valuable services of the metal exchange is regarded the fact that contracts can be concluded from prompt to 9o days forward, thereby giving the facility of hedge, i.e. exclusion of the risk of price movements in the period covered.
An example: a cable manufacturer sells his product for delivery in 9o days, based on the "unknown" price on the LME prevailing then. Whilst he buys the ingots prompt, simultaneously he sells the same quantity for 9o days, thereby excluding the risk of price fluctuation. By the way, the LME contracts can be prolonged by 9o days each at liberty, so the risk of price changes over longer time periods may be discounted.

There is such a lot of combinations and variations around that it would fill a booklet in itself. Aluminium being the non-ferrous metal No. 1., this is understandable. The main questions are briefly these. 1./ where does the world economy move to in general? Everybody knows that cartels /like producer prices/ keep themselves best in times of a boom. Since the aluminium market was relatively strong even in the worst days of the recent recession, the good demand helps the producers to foil the introduction of aluminium to the exchange. 2./ Most of the leading merchants operating on the free market are also among the leading brokers on the L.M.E. They have in the past been keen on getting aluminium "to the market". With "swaps" and the growing participation of "LME customs-cleared" metal from outside, they prefer to maintain the unsettled situation /"muddle"/ as it was before. 3./ Generally and especially within the integrated groups the manufacturers of semis and of finished goods would prefer a realistic /accurate/ gauge for the ingot price. Will they have the fair chance to voice their interests? There are many people around thinking that a reply to these questions will be given in 1976 or latest by 1979.

5. The specific market situtation of aluminium semis.

It is clear that the higher aluminium is processed, the higher price it will fetch. Yet this does not mean that also the profit on the product would correspondingly increase. Anyhow, the general tendency is not to stop at smelting but to get a share on the transformation of the metal as well. We have touched at this question when speaking of integration. Not only the international companies but the state owned aluminium industry is, of course, also intensively engaged on the processing side.

The really keen competition in aluminium is taking place just at that level, at the sale of semifinished goods /"semis"/. Whilst the primary aluminium production, pricing and international trade are characterised by great publicty, the statistics relative to semis and finished product are much more complex. Whilst the price of those semifinished products, which are made in biggest quantities, can be followed relatively well, the higher qualities and specialities which certainly bring the best returns, have no price publication at all.

It is also important to note that whilst the smelting of aluminium can only be done in big units, with substantial capital investment, semis can often be produced economically in small shops with little investment. Therefore, the production of semis is much more diversified than primary smelting.

The acquisition of a market share needs proper study of the actual stand of consumption domestically and of those foreign markets, which the producer will try to include. Whilst the biggest users /e.g. cable factories, mass-goods manufactureres/ can be approached direct, distributors will be needed to reach the small consumers. The potentional of the market in different aluminium products may greatly vary in every country depending on government, private and foreign investments, etc. With the major uses of aluminium we will deal at the end of this paper. Cooperation agreements, leasing and other varieties /e.g. purchase of know-how/ may also assist the establishment or development of semis manufacture.

Mention has to be made of the fact that the international movements of primary /and secondary/ metal are by far easier than of semis. While the import of metal is levied with relatively low import duty or may be duty free, if the importing country does not produce same, the semi-manufacturing being much more extended, in many countries you will find protective duties on semis. To take the example of Austria, the import duty is 17% for sheets and extrusions and 27% on foils for countries outside EEC and EFTA. - Also such administrative measures like import contingents, individual licencing, preferential duties /favouring certain countries / frequently aggrevate the export of semis to many, otherwise potential, markets.

Aluminium being a relatively soft metal, greatest care has to be taken at the packing and forwarding. It happens very often that the great care and the expense with which the product was made, are spoiled by defective packing, because the latter cannot withhold the duress of transport and when arriving at the destination, the semifinished product carries the value of scrap only... Whoever starts with the production of aluminium semis, should strongly keep this in mind.

The imports and exports of some countries in 1976 /U.S.S.R. in 1975/ are enlisted below, in thousand tons /semis only/:

	Import	Export		Import	Export
Germany F.R.	247,3	375,8	Spain	12,6	33,6
Belgium/Luxemb.	96,5	198,2	Switzerl.	3o,4	66,8
France	175,2	165,4	Sweden	58,9	45,1
U.K.	128,6	92,3	U.S.S.R.	3,5	1o1,5
Italy	62,o	125,7	Japan	21,2	8o,3
Netherlands	136,6	71,1	U.S.A.	1o8,1	238,6
Austria	32,2	64,3	Canada	92,8	17,7

6. Groups of semiproducts, by production technology.

Hereunder we quote the production figures by technology of a few large producers, in 1975 /U.S.A. 1974/ in thousand tons.

	U.S.A.	Japan	U.K.	Italy
Plates, sheets, strips	2,583,3	341,9	181,1	13o,o
Foils	339,3	53,4	4[illegible],o	21,2
Tubes, bars, wire and extruded shapes	1,o15,o	[illegible]15,3	116,6	93
Electric conductors	9o9,[illegible]	98,9	4[illegible],[illegible]	18
Castings	798,1	361,2		167
Forgings	62,9	1,[illegible]	4,2	
Powder, flake, paste	8o,3	1o,o	7,8	

Of the "wrought" products rolled goods are on the first place. From thick plates down to foils /with a few microns - 1/1000 of a millimeter- thickness/ all are made with the same technology. A preheated slab is rolled through between two cylinders /rolls/ to get a thinner gauge and this procedure is repeated until the final thickness is obtained. The metal gets harder after a few "reductions" and will be annealed before continuing the rolling. The extremely good malleability of aluminium is showed by the thickness of foils. Only tin and precious metals can be rolled to such gauge, /lately also stainless steel to razor blades but that is much thicker/.

The classical sheet is of one by two meters size, one millimeter thick, 99 or 99,5 %, unalloyed. The rolling charge on top of the ingot price used to be 3oo to 5oo $ per ton, including packing.

Small rolling shops can roll out from home cast small slabs strips, which they usually cut to circles for making household utensils. The mill also has a foundry to remelt the cutting and ingots and to cast the slabs, with very simple equipment. - From such small units up to very big semi-continous wide-strip rolling mills /where 5o thousand tons are regarded presently as minimum economic size/ is aluminium rolled. According to size, alloy, heat treatment, thickness, the price varies widely.

Rod, bars, wires can also be rolled at first between conic /tapered/ rolls and then drawn to size /with intermittent annealing/.

Extrusion is the other extensively used technology of making aluminium semis. Instead of a flat slab or bloom the production starts from a round cast billet, which is preheated and put into the "receptor" of the extruder and then pressed through a tool giving the required cross-section of the bar. The surface of the

products can be shaped by subsequent drawing. Tubes are exclusively made by extrusion.

Casting is outside the group of "wrought" products. At first a mould is made and the liquid metal is poured into, obtaining the required shape! Depending upon the type of the mould, the types are: sand casting /with hand-made sand mould for every cast separately/, - mould casting, with permanent /iron/ mould-and pressure casting, for complicated shapes, great series, accurate measures but with very expensive casting tools.

7. Group of semiproducts, by their uses and applications.

The following table shows the consumption of aluminium /in percents/ of a few selected european countries in 1976 and also the total consumption /thousand tons/ in 1974 to 1976, as well as the average yearly growth rate between 1966 and 1976.

	U.K.	West Germany	France	Spain	Italy	Austria	Hungary
Transport	22,5	15,8	26,0	22,9	25,6	4,3	8,3
Engineering	6,3	8,1	4,8	4,4	6,4	2,7	3,2
Electrical	11,5	9,8	12,8	14,9	4,7	13,1	22,2
Construction	16,9	15,6	8,5	19,6	18,7	9,3	10,0
Chemical, food, agricultural	0,7	1,2	2,0	3,0	1,9	1,2	3,8
Packaging	8,2	8,0	7,2	9,3	8,9	4,6	9,5
Domestic and office	9,2	7,0	9,1	9,9	12,3	2,1	3,3
Powder and paste	1,7	0,3	0,2	0,1	0,5	2,5	1,9
Iron and steel	4,2	4,3	3,8	0,7	2,7	4,2	8,5
Miscellaneous	13,0	9,5	7,7	7,1	3,8	5,6	7,9
Export of semis	11,6	23,4	21,8	8,7	14,2	20,4	25,4
Total consumption							
1974	613,4	1,081,8	629,9	259,8	570,0	90,8	158,3
1975	498,4	910,8	544,5	238,1	441,6	89,4	183,2
1976	550,0	1,172,8	669,2	268,4	587,7	116,4	184,0
yearly average growth rate 1966/76	1,9%	6,9%	6,2%	10,0%	8,8%	10,6%	7,9%

The grouping of consumption in India is the following: electrical 52%, household and consumption goods 20%, transportation 12%, building and construction 6%, packaging 4%, other 6%.

In the field of transportation aluminium has its obvious advantage by the low specific weight. Automobiles have very great possibilities in using more aluminium, this can rise to multiples of the present utilization. With the striving to save fuel, all kinds of vehicles may profit by enlarged use of the metal /e.g. railways/. On the engineering field the competition still goes on between zinc, iron and steel, and aluminium in castings.

As regards electrical conductors, the usage greatly varies among the different countries. The main terrain being overhead high-voltage cables, the consumption is closely linked to electrification programmes. Since during the next quarter of a century a great part of new aluminium smelters will be erected in less developed countries, a proportionately large electrification will necessarily be connected.

The field of packaging is one of the **main consumers of aluminium** because of its resistance to organic acids in food stuffs, its easy handling and ability to combine with other materials /paper, plastics/. Same applies to domestic and office use.

Building and construction are those fields, where in all probability great potentials can be exploited, because up to date building uses it in a constantly growing rate. While in the [illegible] goes within this group to private houses, in most countries presently public constructions and factory halls take up the bulk. There is slight doubt that construction will show one of the most dynamic growths in the use of aluminium.

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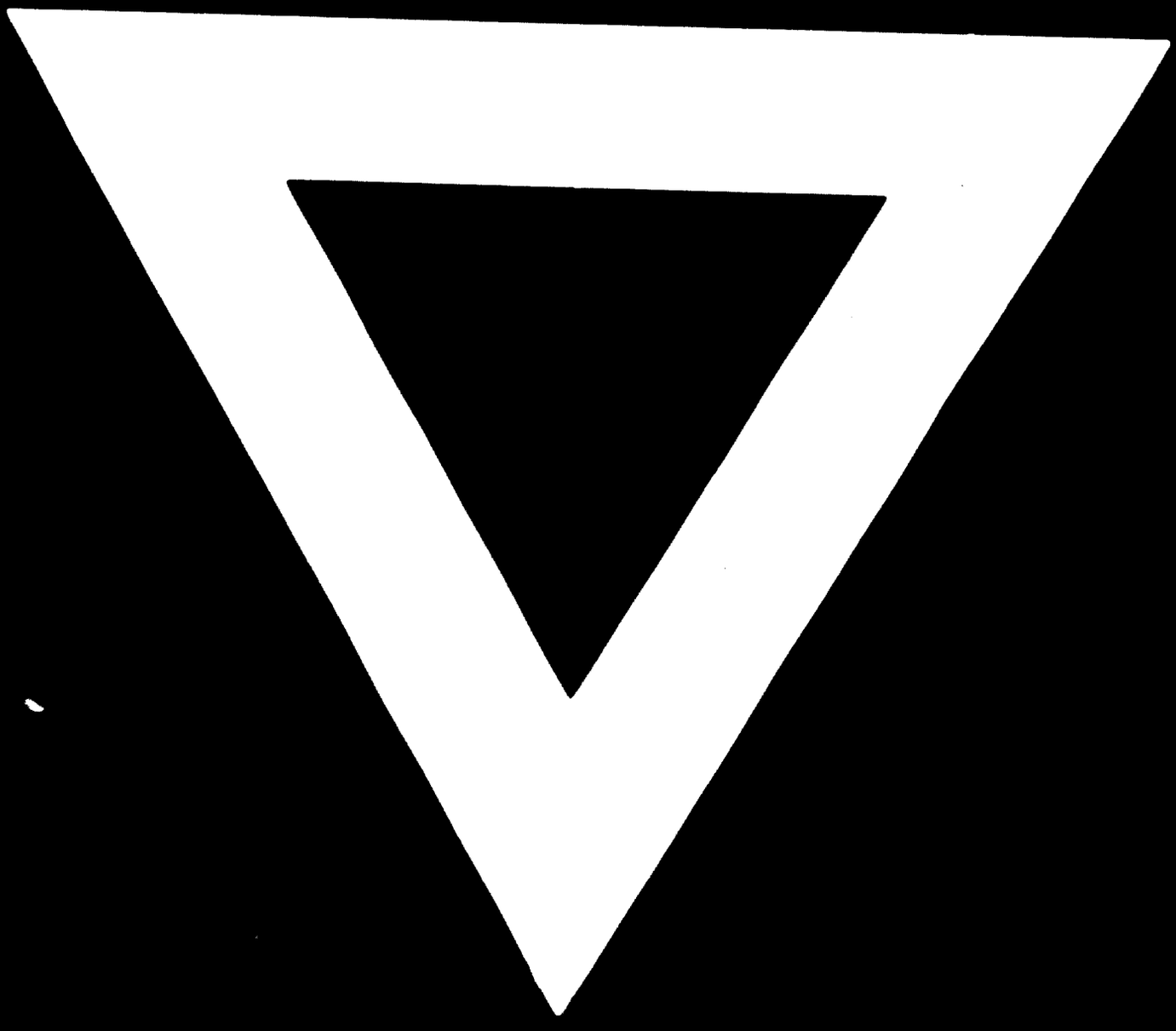

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