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

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DEVELOPMENT OF COOPERATION AMONG THE ARAB COUNTRIES IN IRON AND STEEL PRODUCTION USING THE DIRECT-REDUCTION TECHNIQUE*

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Prepared by:

M. O. Benouali, UNIDO consultant

* This document has not been edited.

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INTRODUCTION

PURPOSE OF THE REPORT

The present document is intended to serve as a basis for discussions at the workshop to be held in Egypt during 1993 for Arab steel-producing countries, chiefly those using the direct-reduction method.

It will enable them to examine the state of the Arab iron and steel industry, and specifically the processes used, the output of the different countries, the consumption of iron and steel products, the development projects, the strengths and weaknesses of the industry, and the possible areas of cooperation.

DRAFTING AND CONTENT OF THE REPORT

This report has been drawn up on the basis of information gathered during missions fielded in the various countries, discussions held with government officials and senior management of the Arab iron and steel companies, and also the reports prepared for a number of meetings and seminars organized on various aspects of the iron and steel industry in the Arab world.

It gives a summary of the world iron and steel industry and sets the Arab iron and steel sector against that background in terms of its features, processes, output, consumption and development. It also provides specific details on the use of the direct-reduction method at Arab plants and of possible areas of cooperation among the Arab countries.

I. OVERVIEW OF THE WORLD IRON AND STEEL INDUSTRY

1.1 Trends in world output

World steel production 1/ showed satisfactory growth between 1982 and 1986, rising from 645 million tons to 786.182 million tons; thereafter it began to decline, falling to 769.991 million tons in 1990 and to 733.734 million tons in 1991. The countries most affected by this decline were the Eastern European States, whose output fell from 203.280 million tons in 1990 to 165.932 million tons in 1991.

Production in the most developed countries fell from 391.231 million tons in 1990 to 379.998 million tons in 1991, the largest decrease occurring in the United States of America, where output declined from 89.723 million tons in 1990 to 79.203 million tons in 1991.

By contrast, the Arab countries' steel production underwent a significant increase, rising from 5,931,500 tons in 1990 to 7,175,720 tons in 1991, which represents about 1 per cent of world output.

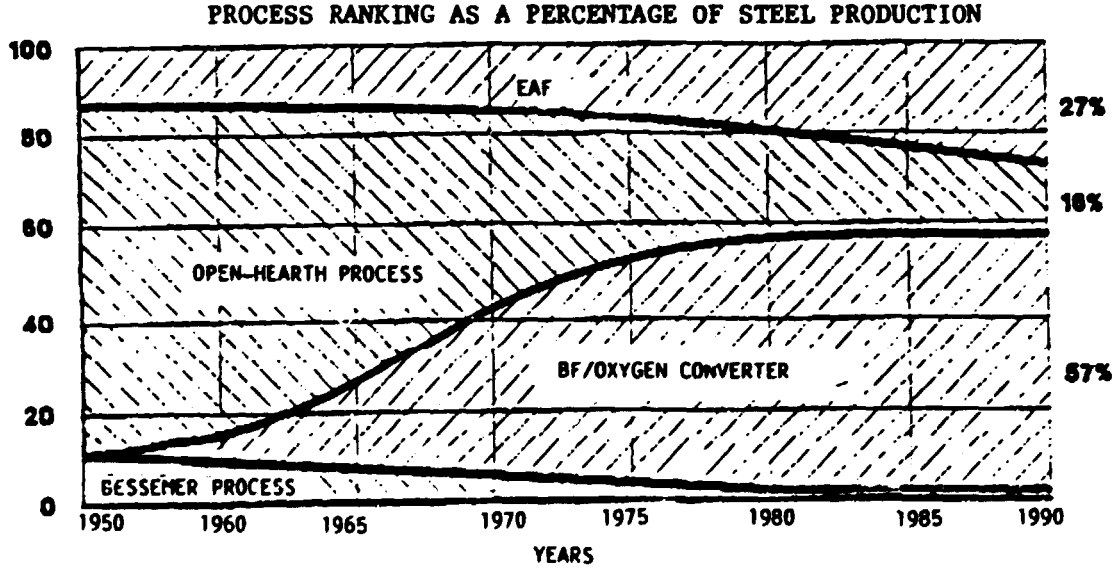
1.2 The processes used

There are four processes in use: open hearth, Bessemer, blast furnace and oxygen converter (BF/OC), and direct reduction and electric-arc furnace (DR/EAF).

The open-hearth system was the process most used between 1955 and 1970, accounting for between 70 per cent (in 1955) and 40 per cent (in 1970) of world steel production; by 1990, it accounted for just 16 per cent, compared with 57 per cent for the BF/OC method, the DR/EAF process representing 27 per cent.

These fluctuations are illustrated in the diagram below.

PROCESS RANKING AS A PERCENTAGE OF STEEL PRODUCTION



1/ Source: International Iron and Steel Institute.

1.3 Output of the main producing countries in 1991

This is shown 2/ in the table below which however does not include the output of some developing countries or countries of the Communist group, such as China (which produces 71 million tons) and the Democratic People's Republic of Korea (which produces 7 million tons).

Table 1

(in thousands* of tons)

PROCESS / REGION	TOTAL	BF/OC	EAF	OPEN HEARTH	OTHER
Industrialized countries	379.4	251.1 66.2	125.1 33	3.1 0.8	0.1
Developing countries	96.7	57.8	33	5.3	0.6
Arab countries	7.1	2.1 29.6	4.8 67.6	0.2 2.8	0.00
Eastern European countries	166.02	65 39.2	24.4 14.7	76.5 46.1	0.00
World total	642.1	373.9 58.2	182.5 28.4	84.9 13.2	0.7

* Translator's note: Thus on the original.

2/ Source: International Iron and Steel Institute.

II. STATE OF THE ARAB IRON AND STEEL INDUSTRY

2.1 Background survey

There was no iron and steel industry in the Arab countries prior to the 1950s. It was not until 1956 that two plants came into being: one at Helwan, Egypt, with an annual capacity of 1.5 million tons, using the conventional BF/OC process, and the other at Oran, Algeria, employing the open-hearth method, with an annual capacity of 100,000 tons.

During the 1960s, two further plants that employ the conventional system were set up, one (in 1965) at Bizerte, Tunisia, with an annual capacity of 180,000 tons, and the other (in 1969) at El Hadjar, Algeria, with an annual capacity of 500,000 tons.

In 1978 and 1979, two integrated plants that use the direct-reduction technique went into production: one in Qatar, with an annual capacity of 400,000 tons, and one in Iraq, with an annual capacity of 1,200,000 tons; also, a number of rolling mills for reinforcing rods were started up during that decade in Morocco (1971), Jordan (1975) and Sudan.

In 1980, steel production in the Arab States amounted to almost 3 million tons.

It was during the 1980s that the installed steelmaking capacities of the Arab countries underwent a significant expansion, with the expansion of the Algerian steelworks and the start-up of the Saudi Arabian, Egyptian and Libyan plants, developments that brought the overall capacity to 8.63 million tons by 1991.

2.2 Resources

Taken as a whole, the Arab countries possess considerable resources with which to develop their iron and steel industry, in particular iron ore and energy (oil, natural gas and liquefied petroleum gas).

- Iron ore

This is the most important basic material for the iron and steel industry. The Arab countries have extensive deposits, some of which are currently being mined, notably in Mauritania (which is a major exporter of iron ore), Algeria, Tunisia, Morocco and Egypt.

The Arab countries' reserves are shown in the table below.

Table 2

(in millions of tons)

RESERVES / COUNTRY	Fe PERCENTAGE	RESERVES IN MILLIONS OF TONS CONFIRMED	PROBABLE	POSSIBLE	TOTAL
Mauritania	65-67	2 064		2 060	4 124
Morocco	30-56		1 014		1 014
Algeria	47-57	1 076	2 107	25	3 208
Tunisia	44-55	7.8	4.5		12
Libyan Arab Jamahiriya	38-54	2 017	600		2 617
Total Maghreb		5 164.8	3 725.5	2 085	10 975
Egypt	25-58.5	258	29	158	445
Sudan	37-69	36		735	771
Syrian Arab Republic	25-33	107	400		507
Jordan	63-64	0.66			0.66
Iraq	16-30	30			30
Total Middle East		431.66	429	893	1 753.66
Saudi Arabia	22-80	128.5	2 490		2 618.5
Other Gulf States				30	30
Total Gulf States		128.5	2 490	30	2 648.5

- Energy

Most of the Arab countries have sizeable energy reserves, particularly of natural gas, which is used in the iron and steel industry. They total 3,600 billion cubic metres for the Maghreb States and 5,900 billion cubic metres for the Middle East countries.

2.3 The market

The economic and social development of most of the Arab States, particularly the high- and middle-income countries, is continuing at an ever-increasing pace, generating high demand for a variety of products, including those needed by the construction industry, among them iron and steel products.

By 1990, the Arab countries' consumption of iron and steel products had reached a level of over 14 million tons. The breakdown of this figure by individual country is shown in the table below.

Table 3

(in thousands of tons)

PRODUCTS / COUNTRY	REINFORCING RODS AND WIRE	TUBES	FLAT PRODUCTS	SECTIONS	TOTAL ALL PRODUCTS
Mauritania	21	2	6	6	35
Morocco	472	46	137	94	749
Algeria	915	371	713	255	2 254
Tunisia	252	39	120	26	437
Libyan Arab Jamahiriya	660	94	209	59	1 022
Total Maghreb	2 320	552	1 185	440	4 497
Egypt	1 300	247	745	500	2 792
Sudan	57	16	14	8	96
Syrian Arab Republic	151	86	86	15	338
Jordan	294	23	17	45	338
Lebanon	183	3	17	5	208
Total Middle East	1 985	376	879	532	3 772
Iraq	175	173	133	149	630
Kuwait	160	122	71	70	423
Saudi Arabia	2 255	512	507	463	3 737
Qatar	50	45	33	31	159
United Arab Emirates	120	70	138	73	401
Bahrain	25	32	32	30	119
Oman	38	150	40	40	268
Total Gulf States	2 823	1 104	954	856	5 737
Other Arab countries	13	27	25	6	71
Total Arab countries	7 141	2 059	3 043	1 834	14 077

According to estimates based on past consumption and on projected demand generated by the anticipated growth, future requirements are predicted to be close to 24 million tons by 1995, 30 million tons by the year 2000, and over 37 million tons by the year 2005. A summary of expected future demand by product type is given in the table below.

Table 4

(in thousands of tons)

PRODUCT / YEAR	1995	2000	2005
Reinforcing rods and wire	11 400	14 000	17 500
Sections	2 200	2 700	3 200
Flat products	6 000	7 600	9 600
Tubes	4 500	5 700	7 200
Total	24 100	30 000	37 500

2.4 Installed production capacities

The capacities currently available (1992) in the Arab world are still well below the level of demand. They stand at 8.6 million tons of crude steel, 6 million tons of long products (which include over 90 per cent reinforcing rods and wire), 3.5 million tons of flat products, and 1 million tons of tubes. The breakdown of these capacities is set out in the table below.

Table 5

COUNTRY / PRODUCT	CAST IRON	SPONGE IRON	CRUDE STEEL	REINFORCING RODS AND WIRE	TUBES	FLAT PRODUCTS
Mauritania			12	36		
Morocco				515	64	6
Algeria	1 690		2 180	620	255	2 000
Tunisia	160		190	180	21	
Libyan Arab Jamahiriya		1 100	1 304	460	120	720
Total Maghreb	1 850	1 100	3 686	1 811	460	2 720

Table 5 (continued)

COUNTRY / PRODUCT	CAST IRON	SPONGE IRON	CRUDE STEEL	REINFORCING RODS AND WIRE	TUBES	FLAT PRODUCTS
Egypt	1 700	716	2 932	1 202	141	822
Sudan				70	20	
Syrian Arab Republic			130	120	20	
Jordan			30	390	30	
Lebanon				240		
Total Middle East	1 700	716	3 092	2 022	211	822
Iraq		1 200	480	260	90	
Kuwait					170	
Saudi Arabia		1 450	850	940	80	
Qatar		400	415	330		
United Arab Emirates			110	110		
Total Gulf States		3 050	1 855	1 640	340	
Total Arab world	3 550	4 866	8 633	5 473	1 011	3 542

2.5 Output

Despite the installation of new facilities, nowhere in the Arab iron and steel industry have production capacities ever been utilized to full extent, with the exception of a few plants (Tunisia, Qatar, Saudi Arabia and ANSDK Egypt). A considerable improvement has, however, been observed in recent years, crude steel production having risen from 5,931,000 tons in 1990 to 7,176,000 tons in 1991 and finished product output to 7,889,000 tons. Capacity utilization rates have reached 83 per cent for crude steel and 74 per cent for finished products.

The breakdown of the output for the Arab countries is indicated in the table below.

Table 6

(in thousands of tons)

PRODUCTS / COUNTRY	CRUDE STEEL	FINISHED PRODUCTS				TOTAL FINISHED PRODUCTS
		REINFORCING RODS AND WIRE	SECTIONS	FLAT PRODUCTS	TUBES	
Mauritania	7	6				6
Morocco		417			35	452
Algeria	1 394	367		623	170	1 160
Tunisia	198	206			20	226
Libyan Arab Jamahiriya	1 016	375	57	397	50	879
Total Maghreb	2 614	1 371	57	1 020	275	2 723
Egypt	2 010	1 032	293	475	80	1 880
Sudan		50			15	65
Syrian Arab Republic	63	82			15	97
Jordan	30	290			20	310
Lebanon		180				180
Total Middle East	2 103	1 634	293	475	130	2 532
Iraq		100	50		50	200
Kuwait					40	40
Saudia Arabia	1 840	1 684			80	1 764
Qatar	573	560				560
United Arab Emirates	45	70				70
Total Gulf States	2 458	2 414	50		170	2 634
Total Arab world	7 175	5 419	400	1 495	575	7 88,

2.6 Production methods

Virtually all the steel produced by the Arab countries is obtained using the conventional method (in Egypt, Tunisia and Algeria), which accounts for

41.9 per cent of total output, the electric-furnace steelmaking process representing 56.5 per cent.

There are still a few facilities in existence in Algeria and Egypt that use the open-hearth process.

The breakdown of existing capacities in the Arab world by method is shown in the table below.

Table 7

(in thousands of tons)

CAPACITY/METHOD / COUNTRY	TOTAL CRUDE STEEL	BASIC OXYGEN STEEL	ELECTRIC-FURNACE STEEL	OPEN-HEARTH STEEL
Mauritania	12		12	
Algeria	2 180	1 960	120	100
Tunisia	190	155	35	
Libyan Arab Jamahiriya	1 304		1 304	
Egypt	2 933	1 500	1 196	237
Syrian Arab Republic	130		130	
Jordan	30		30	
Iraq	480		480	
Saudi Arabia	850		1 050	
Qatar	415		415	
United Arab Emirates	110		110	
Total	8 634	3 615	4 882	337

III. DIRECT REDUCTION IN THE ARAB COUNTRIES

3.1 Background summary

The first steelworks in the Arab world to use the direct-reduction method was built in Qatar in 1978.

Employing the Midrex process and built in partnership with a Japanese firm, this plant constituted a model from all points of view (construction time, product quality and productivity) for the other Arab countries that opted for this method. Thus, Iraq, the Libyan Arab Jamahiriya, Saudi Arabia and Egypt all chose the direct-reduction technique to develop their iron and steel industries. Since that time, over half the steel produced in the Arab countries is manufactured by this system. Also, the projects currently under consideration are designed to use the direct-reduction method.

3.2 Advantages of the direct-reduction technique for the Arab countries

The advantages of this steel production method for the Arab countries are many and include, in particular:

- Exploitation of local natural resources, namely energy, which is available in large quantities and at low cost, and also iron ore, even if this is not yet being mined in all the Arab States.

- Substitution of local materials for imported materials: The conventional method involving blast furnaces and oxygen converters requires coke as an input; this is produced by no Arab country and is marketed by only about 10 countries across the world, which fix the price as they please. The same applies to iron and steel scrap, a further input, whose main producer and exporter is the United States of America.

- Low investment costs compared with those required for conventional steel plants, owing to the economies of scale achieved. Studies have shown that the cost of one direct-reduction plant is around 30 per cent of the cost of an identical plant using the blast-furnace and oxygen-converter method.

- Emergence of new technologies, which have led to the development of mini- and pocket steelworks capable of serving small markets or specific market segments.

- Low labour input: The direct-reduction method is less labour-intensive than the conventional method. As such, it represents a clear advantage for most of those countries that have opted for it and that are importers of labour (Qatar, the Libyan Arab Jamahiriya and Saudi Arabia).

- Low water consumption in this process, as compared with the conventional system, an important factor particularly when one considers that there is a water problem in virtually all the Arab countries.

- Low cost of steel production: Because of the advantages referred to above, the cost of producing steel by this method is 15 to 20 per cent lower than by the conventional method, even with the need to import iron ore or pellets and iron and steel scrap.

3.3 The processes used

Several direct-reduction processes exist in the world, the main ones being Midrex, HYL-I, II and III, Purofer, FIOR, ACCAR and Armco.

The most widely used are Midrex (in operation at about 62 per cent of existing plants), HYL-I (about 20 per cent), and HYL-III (about 8 per cent).

The proportion is higher in the Arab countries, where Midrex accounts for 68 per cent of the installed capacity as against 32 per cent for HYL. Over 90 per cent of production is by the Midrex process.

The table below gives a breakdown of 1991 sponge-iron capacities and production, by process, for all the Arab countries.

Table 8

(in thousands of tons)

PROCESS / COUNTRY	MIDREX		HYL	
	CAPACITY	PRODUCTION	CAPACITY	PRODUCTION
Qatar	400	400		
Iraq			1 200	200
Saudi Arabia	1 450	1 450		
Egypt	716	716		
Libyan Arab Jamahiriya	1 100	860		
Total	3 666	3 426	1 200	200
Percentage	68	94	32	6

3.4 Arab plants that use the direct-reduction method

There are at present five integrated complexes that operate using the direct-reduction method with electric-arc furnaces. They are:

- QASCO in Qatar;
- SEIS in Iraq;
- Hadeed in Saudi Arabia;

- ANSDK in Egypt;

- EBISCO in the Libyan Arab Jamahiriya.

The annual installed capacities at these complexes amount to a total of 4,535,000 tons.

These plants fall into two categories:

3.4.1 Plants that after a satisfactory construction and start-up phase quickly reached their nominal capacity:

- The Qatar Steel Company Ltd. (QASCO), located at Umm Saïd, was built in 1978 in cooperation with a Japanese partner (Kobe Steel) and has a Midrex series 400 module with an annual capacity of 415,000 tons.

  This complex, the first of its kind in the Arab world, quickly attained its nominal capacity and is currently operating at over 130 per cent of that capacity.

- The Hadeed Company located at Jubaïl, Saudi Arabia, was started up in 1982 with two Midrex series 400 modules having a capacity of over 800,000 tons. By 1989, output had reached 1,200,000 tons, i.e., 150 per cent of the plant's nominal capacity.

  This steelworks has been enlarged by the addition of one Midrex series 600 module with a capacity of 650,000 tons, which was placed in operation in 1991. The plant's total output for 1991 was 1,840,000 tons of steel.

- The Alexandria National Iron and Steel Company (ANSDK), located at Al Dakheila, was constructed between 1985 and 1986 in cooperation with a Japanese consortium. It has a Midrex series 600 module with an annual capacity of 716,000 tons. The plant went into operation in May 1986 and reached full capacity in 1987. By the end of 1991, it was operating at around 150 per cent of its nominal capacity.

3.4.2 Plants whose construction or start-up was delayed

- The Executive Board for Iron and Steel Complex (EBISCO), located at Misurata, Libyan Arab Jamahiriya, has two Midrex series 600 modules with a total annual capacity of 1,100,000 tons.

  Plant construction began in the late 1970s but fell severely behind schedule, the plant becoming operational only in 1989. It nevertheless reached 92 per cent of its nominal capacity in 1991.

- The State Enterprise for Iron and Steel (SEIS), located at Khor Zoubair, Iraq, was started up in 1979 but had to be shut down in 1980 because of the war with Iran. It uses the HYL-I process and has an annual capacity of 1,200,000 tons. Production was resumed at the plant in 1989.

3.5 New projects

A comparison of the steel consumption figures for all the Arab countries together (14 million tons in 1991 and an expected 30 million tons by the year 2000) and the steel production figure for the same group of countries (just under 8 million tons in 1991) justifies further investment by the Arab States in the construction of iron and steel plants to meet the region's ever-increasing demand.

There are a number of projects at different stages of advancement. Some countries have opted for the installation of rolling mills as an initial strategy, in order to respond quickly to a pressing demand for long products in particular, and intend at a later date to add the production of crude steel. This is the case with the following firms:

- **SONASID**, in Morocco, which has installed rolling mills with a capacity to process 420,000 tons of reinforcing rods and is planning to integrate the plant by setting up an electric-arc furnace and a continuous-casting plant.

- **MASID**, in Morocco: Project shortly to be launched (the contract is currently being signed) involving an electric-arc furnace and a rolling mill for reinforcing rods and light sections, designed to produce 250,000 tons of reinforcing rods.

- **METALSIDER**, in Algeria, which already possesses an electric furnace and a rod and merchant bar rolling mill with an annual capacity of 300,000 tons, and aims to double this capacity in a second phase currently being planned.

- **EL FOUALDH**, in Tunisia, which is intending to construct a 35,000-ton pocket furnace and increase the capacity of its wire mill to 250,000 tons.

- **Two projects involving the installation of rod mills** (one with a capacity of 100,000 tons and the other with a capacity of 200,000 tons) have been approved in Tunisia.

Integrated projects are planned in some countries, including:

. Algeria:

- **SIDER at El Hadjar:** Project involving the construction of an electric-arc furnace to supply the weldless tubeworks in particular and the expansion of the reinforcing-rod production capacity.

- **SIDER at Bellara:** This project was planned some years ago but its implementation has been delayed. It involves a direct-reduction plant with a capacity of 1 million tons, comprising a direct-reduction unit, an electric-arc furnace and a rod mill.

- **SIDER** has also been planning a project concerning a pre-reduced pellet production plant at Djendjen, near Bellara, with an annual capacity of 1.5 million tons, approximately 50 per cent of whose output will be earmarked for export.

- A project involving a reinforcing-rod production unit with an annual capacity of 450,000 tons and comprising an electric steelworks and a rolling mill is also being planned by the public enterprise COSIDER.

. Syrian Arab Republic:

- ZAARA direct-reduction project comprising a direct-reduction unit, an electric-arc furnace and a rod mill.

. Egypt:

- A plant to manufacture special steels is currently being built by the Arab Company for Special Steel. Production start-up is scheduled for 1995-1996.

  It is also planned to expand the EBISCO plant at Misurata in the Libyan Arab Jamahiriya and the ANSDK plant in Egypt.

In addition to these steel production projects, there is a project dating from the 1970s involving the conversion of Mauritanian ore into pellets required for the operation of the Arab direct-reduction plants that import them. The scale of this project is such that it will produce 5 million tons of pellets per annum.

The aim of the project is to provide a reliable source of supply for the Algerian, Libyan and Egyptian plants.

3.6 Prospects for the development of the direct-reduction technique in the Arab world

The advantages listed in subsection 3.2, primarily the availability of raw materials such as iron ore and natural gas in large quantities in the Arab world, offer considerable prospects for the sustained growth of the iron and steel industry, particularly as regards the direct-reduction method.

The installed capacities for electric-furnace steelmaking already exceed those for oxygen-converter steel production (cf. table 7), the former accounting for 56.5 per cent of production and the latter for approximately 42 per cent.

Also, it can be seen from table 1 that around 68 per cent of the current steel output of the Arab countries is produced by the DR/EAF method. This figure will continue to rise as the projects currently at the construction or planning stage are completed. Furthermore, for reasons of cost and non-availability of coke in the Arab countries, no country is contemplating building a plant that uses the BF/OC system, and it is a virtual certainty that the only plants using that system will continue to be those that currently exist in Egypt, Tunisia and Algeria.

The flexibility offered by the direct-reduction method and electric-arc furnaces will allow the "small markets" to build up their own iron and steel industries in simple stages that will enable them to integrate their plants and master the technology. A possible first step in this process might be the installation of rolling mills processing imported semi-finished products, supplemented at a later date by the construction of plants designed to

manufacture these semi-finished products and consisting of several direct-reduction units, an electric-arc furnace, a continuous-casting plant, etc.

This course has been chosen by several countries whose demand for finished products (in particular, reinforced rods and merchant bars) could be fully or partly met through local production. Such is the case with Morocco, Mauritania, Sudan, Lebanon, Jordan and the United Arab Emirates. These countries, which have installed rolling mills, have incorporated an electric-arc furnace or are planning to install one together with the ancillary units.

A further possibility is to build a direct-reduction plant whose products might then be exported pending the downstream integration of the plant through the addition of an electric-arc furnace, a continuous-casting plant and rolling mills.

At the present time, however, except in the countries referred to above that have opted for a phased integration approach, the direct-reduction plants existing in the Arab world have been designed and built as integrated complexes. Such is the case with: QASCO, SEIS, Hadeed, ANSDK and EBISCO.

It can thus be seen that the direct-reduction technique will have a major role in future steelmaking in the Arab world, where, by the year 2000, 75 to 80 per cent of steel will be produced by this method. A choice of processes will of course remain. Currently, Midrex is carving out the "lion's share", with DR/EAF accounting for 68 per cent of the installed production capacity and 94 per cent of steel output.

The process sellers will face a hard battle in persuading their Arab customers to choose in their favour.

IV. OPPORTUNITIES FOR COOPERATION AMONG THE ARAB COUNTRIES

4.1 Status of cooperation among the Arab countries

Because this is a recent industry in this region and the demand for iron and steel products in the Arab world is met almost exclusively from exports, the Arab countries have acted without coordination in developing their production capacities. In addition, a lack of trained managerial and other staff has meant that international assistance has been sought.

Efforts at regional coordination and cooperation were, however, initiated at a fairly early stage, with the establishment in 1977 of the Arab Iron and Steel Union (AISU), which brought together nearly all the Arab operators in this field (producers, importer-distributors and users). Although the Union has not fully achieved its objectives, still it has enabled operators in various countries to get to know one another, engage in dialogue and learn from one another's experiences through meetings, symposia and congresses, to which leading personalities and international experts in the field have also been invited. But apart from a few exchanges of delegations, plant visits and limited training courses, no genuine cooperation projects (joint ventures, research and development, product exchanges, etc.) have been undertaken.

A few joint schemes (such as the pelletization project in Mauritania, which was contemplated as early as 1973-74) have been studied but have failed to arouse much enthusiasm among the operators, since they have never involved the major financial backers in the Arab world.

As a result of the experience gained, the operators have for some years been moving closer together with the aim of replacing foreign cooperation by inter-Arab cooperation.

Thus it was that the Libyan Arab Jamahiriya sought Algerian and Egyptian expertise in starting up its iron and steel complex, and technical cooperation was initiated between the Algerian and Tunisian iron and steel industries and also among the iron and steel industries of the Gulf States within the framework of the Gulf Cooperation Council.

The Maghreb High Council for Iron and Steel was set up in response to recommendations stemming from the meeting of Ministers of Industry of the Maghreb Union held on 23 and 24 June 1989. It brings together the steel producers of the Maghreb countries, its founder members being:

- The Arab Iron and Steel Company (SAFA) of Mauritania;
- The National Iron and Steel Company (SONASID) of Morocco, whose Director-General was elected President of the Council;
- The Tunisian iron and steel company "El Fouladh";
- The Algerian State iron and steel enterprise "SIDER";
- The Libyan iron and steel complex "EBISCO".

The major objectives of this Council, like those of the councils set up in other sectors, are to ensure coordination of efforts among the Maghreb countries, to promote cooperation, and to encourage complementarity through product exchanges, planning of joint projects, and exchanges of experience.

It might be thought that the Council serves no useful purpose and duplicates the work of the organizations already set up. However, this is not at all the case, given the importance of the subregional blocs - i.e., the Gulf Cooperation Council, the Arab Cooperation Council and the Arab Maghreb Union - to more effective coordination and more fruitful cooperation, since the more those countries share, the closer they become and the more easily they can be integrated.

4.2 Difficulties encountered in fostering cooperation

As we have just noted, cooperation programmes have been initiated among the various Arab countries and coordinating bodies have been set up; this has not, however, been sufficient to create and set in motion an irreversible momentum. Most of the recommendations made during the congresses, seminars and other meetings held have in fact remained unacted upon, despite being "dusted off" from time to time.

We have identified a number of difficulties that have hampered the implementation of the proposed programmes. They are:

- Lack of follow-up action: Following meetings of officials, at whatever level, no follow-up arrangements are scheduled and no work plan to direct the project is drawn up; often, several months elapse before the summary documents listing the recommendations are prepared and distributed to the participants.

- Status of the participants in the meetings: Often the persons taking part in the meetings have no decision-making authority and cannot therefore commit the enterprises or the countries they represent, whereas high-level meetings often provide an opportunity for managers to conclude agreements and sign contracts.

- Non-participation of all the officials of the enterprises involved in joint projects under consideration, which means that overall agreement cannot be reached on the proposals made and no joint-venture or partnership contracts can thus be entered into.

- Projects are often thwarted through lack of money, even though the Arab organizations have the necessary funds and are only waiting to use them, but unfortunately they are often not approached at the start of planning.

- The different and cumbersome administrative and customs procedures of the various countries hamper the free movement of products. These obstacles are currently being removed by the subregional blocs, and the same will later be done at the Arab regional level.

4.3 The possibilities for cooperation

From an examination of the current situation in the Arab iron and steel industry, the present and future demand for iron and steel products and the growth prospects, it can be stated that real possibilities for cooperation among the different countries do exist and are merely waiting to be exploited, if only there were an expression and affirmation of the necessary will and confidence on the past of the decision makers.

The main areas where such cooperation might be initiated are:

- Product exchanges: A number of countries currently produce large quantities of raw materials (iron ore and energy in particular) and of products that other countries import from outside the Arab world. A marketing drive could be pursued by the regional and subregional organizations with a view to concluding agreements between buyers and sellers by facilitating commercial relationships and, if necessary, by offering funding from Arab financial institutions.

- Greater integration at the subregional and regional levels, in order to achieve the necessary complementarities among the various countries, with a view to avoiding the manufacture of competing products and to achieving economies of scale.

- Planning of joint projects on a sound footing and on the basis of reliable market studies, in which financial backers would need to be involved in order to ensure their successful implementation.

- The establishment of joint ventures in the areas of design and engineering. The capabilities that currently exist in these fields need to be combined and could be tapped for the planning of joint projects.

- Technical cooperation: Many Arab countries have achieved significant levels of technical skills, which they can pass on to those countries that lack them, thus contributing to the strengthening of inter-country relationships. Steps in this direction have already been taken between Algeria and Tunisia, between Algeria and the Libyan Arab Jamahiriya, and between Egypt and the Libyan Arab Jamahiriya. It would be to the advantage of these schemes if they were to become more common, since this would contribute to better coordination of action and to the solution of environmental and administrative problems, through the contacts that would be established among technicians.

- Training: This area is linked to the previous one. Many plants, particularly in Algeria and Egypt, have in fact installed extensive training facilities to educate their staff (mainly technicians). These facilities can be used by the other countries and could become centres for the exchange of Arab expertise.

  Contacts have already been established in this area also, but would benefit from being strengthened and regularly followed up in order to encourage the flow of knowledge and information.

- Research and development: Because steelmaking is a recent industry in the Arab world, research and development activities are - apart from the laboratories set up at plant sites - still in their early stages. Egypt and Algeria do, however, possess such facilities and installations, which would benefit from being developed in concert with the other countries that could gain from this.

4.4 Recommendations

On the basis of the possibilities for cooperation as outlined above, we can make the following recommendations for strengthening cooperation:

- Strengthening the links of subregional coordination in order to form the bonds of inter-Arab cooperation;

- More frequent exchanges of managerial staff and visits to technical installations in order to help the parties concerned get to know one another better so that they will be responsive to the call for inter-Arab cooperation;

- Organization of international training courses at all levels (managerial, technical and manual) at existing training facilities or on plant premises; such courses would be attended by trainees and trainers from various countries, and experts of international renown could also be invited to participate;

- Greater resort to subcontracting arrangements between Arab plants. Certain sections at some plants are operating at below their capacity; this idle capacity could be used to make up shortages at other plants or to manufacture spare parts, which are sometimes very expensive to produce abroad;

- Efforts should also be directed at product standardization, since each country has in fact adopted the standards of its licensor or of the supplier of its equipment or processes;

- Development of preferential trade relationships through reductions in the rates of customs duty on products from Arab countries and the promotion of product exchanges.

CONCLUSION

The importance of the iron and steel industry to those Arab countries that are still a long way from meeting their demand in this sector justifies its development through the optimum use of installed capacities and the establishment of additional facilities by completing the projects currently at the planning or construction stage. Even with these projects, demand will continue to be high. It is therefore necessary for the Arab countries to adopt a common policy for this sector with a view to planning joint projects and operating specialized plants at the regional level, particularly in the case of specific products (flat products, seamless tubes and special steels).

To accomplish this, as has been emphasized in this paper, the Arab countries will need to strengthen their cooperation in this sector and mobilize their resources.

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* Source of information contained in tables 2, 3, 4, 5, 6, 7 and 8: AISU.