2018 WORLD DIRECT REDUCTION STATISTICS

MIDREX

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CONTENTS

Audited by WSD WORLD STEEL DYNAMICS®

8.5.2019

New Capacity, Plant Ramp-Ups Boost World DRI Production Over 100M Tons in 2018

Annual global DRI production reached the lofty milestone of 100 million tons in 2018, riding the crest of double-digit growth for the second consecutive year. DRI output was up 15% over 2017 performance. From 2016 to 2018, world DRI production has increased by 38%, which is the largest increase in any two-year period since 1985. The sustained growth through 2018 was driven primarily by strong demand for natural gas-based DRI – an environmentally friendly and low residual metallic that is needed to produce today's premium steel products.

Combined, India and Iran were responsible for more than half of total world DRI production in 2018.

The top five DRI-producing countries last year:

2018 Top 5 DRI Producing Nations

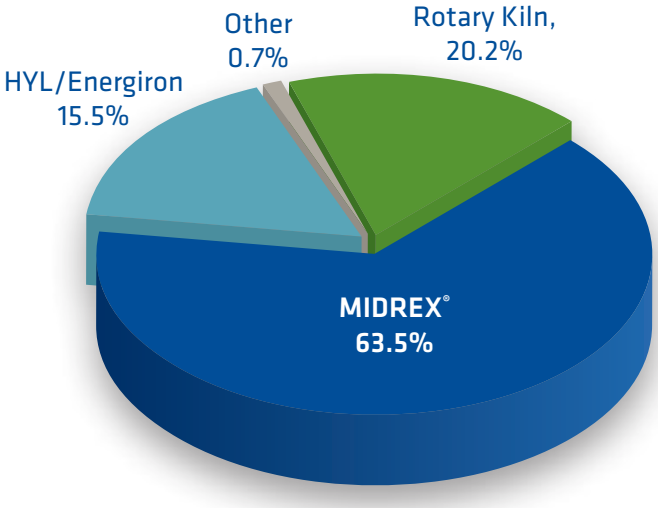
COUNTRY	PRODUCTION (Million Tons)
India	28.11
Iran	25.75
Russia	7.90
Saudi Arabia	6.00
Mexico	5.97

Source: World Steel Association, SIMA, and Midrex Technologies, Inc.

Over 11 million tons of last year's production was hot DRI (HDRI), which is fed directly to the EAF to reduce energy consumption and increase melt shop productivity. Hot briquetted iron (HBI), which is compacted DRI, accounted for 9 million tons of the 2018 total.

Midrex production grew to nearly 64 million tons, which was a 13% increase over 2017.

2018 World DRI Production by Process



Total World Production: 100.5 Mt

	2016	2017	2018
MIDREX®	64.8%	64.8%	63.5%
HYL/Energiron	17.4%	16.9%	15.5%
Other	0.3%	0.7%	0.7%
Rotary Kiln	17.5%	17.6%	20.2%

Source: Midrex Technologies, Inc.

BEHIND THE NUMBERS

Three factors contributed to 2018 production increases: the commissioning of new capacity, especially in Iran, the return to operation of many coal-based rotary kiln furnaces in India, and the further ramp-up of recently commissioned plants.

Iran produced over 25.7 million tons of DRI, all using natural gas, which easily made Iran the number one gas-based producer in 2018. By the end of the year, there were 33 direct reduction modules operating in Iran and at least a dozen more were in various phases of construction. DRI capacity growth has been phenomenal – three-and-one-half times more capacity now than one decade earlier – especially considering the international sanctions placed on the country.

DRI production in India surged to over 28 million tons in 2018, placing it firmly in the lead of all DRI-producing nations. It is estimated that approximately 30% of all DRI and HBI produced last year within India was transported to a steelmaking facility off-site. A very large share of this was via truck transport to nearby melt shops.

Most of the output – nearly 20 million tons – was by rotary kiln plants which use coal as the fuel and the reductant. According to the Sponge Iron Manufacturers Association (SIMA), headquartered in Delhi, there are 315 of these units in operation. The yearly production by these rotary kilns was 35% higher than in 2017.

Another contributor to increased DRI output within India was the stabilization of the COREX® export gas-based and coke oven gas-based plants. The MIDREX® Plants at JSW Steel (Toranagallu) and JSW (Dolvi) set production and performance records during the year while operating with COREX export gas and coke oven gas, respectively. Indian production would be much greater but for the low availability and high cost of natural gas. Production of natural gas-based DRI was 8.14 million tons, an increase of 8% over 2017.

Russia again was the third largest producer of DRI and HBI, accounting for 7.9 million tons, a 13% increase over 2017. This primarily was due to the continued ramp-up of capacity by the newest MIDREX Plant (HBI-3) at Metalloinvest's Lebedinsky GOK in Gubkin, Belgorod region. The HBI-3 Plant has a design capacity of 1.8 million t/y, which gives Metalloinvest an installed annual production capability of 4.5 million tons and reinforces its leading position in the global merchant HBI market.

Saudi Arabia vaulted into fourth place among DRI producers, making 6.00 million tons in 2018, to surpass Mexico, which declined slightly to 5.97 million tons.

Egypt joined the nations producing more than 5 million tons, which is nearly double its output of 10 years earlier. UAE DRI production continued to increase, as it made 3.78 million tons only 8 years after entering the industry.

Venezuelan production fell to less than 1 million tons, which is a little more than 10% of its peak output in 2005 and the lowest performance in 40 years.

There has been notable growth within the USA, due to the combination of an intense demand for low residual iron units and the availability of low-cost natural gas. After the industry was completely shuttered from 2009-2013, the USA produced 3.35 million tons in 2018, with the expectation of significantly greater figures in the coming years.

Algeria joined the ranks of DRI-producers in 2018, with the start-up of a 2.5 million t/y MIDREX Combination HDRI/CDRI Plant for Tosyali Algerie, located near Oran, Algeria.

JSW Steel Toranagallu in Karnataka, India

LGOK HBI-2 and HBI-3 in Gubkin, Russia

8.5.2019

NEW CAPACITY AND PLANTS UNDER CONSTRUCTION

MIDREX®

NEW CAPACITY

World's Largest Single Module HDRI/CDRI Plant Begins Operations at Tosyali Algerie

Tosyali Algerie started up and commissioned a 2.5 million tons per year (t/y) DRI plant equipped with a MIDREX MEGAMOD® furnace, which is capable of simultaneous production of hot and cold DRI (HDRI and CDRI, respectively) to match the requirements of the steel mill. HDRI from the MIDREX Plant is expected to help substantially increase billet production and boost high-quality rebar production to more than 3 million t/y.

Tosyali Algerie started production of steel rebar in Bethioua, near Oran, Algeria, in 2013, by using scrap as feedstock. It subsequently added 500,000 t/y of wire rod production capacity, which was started up in 2015. At this point, the decision was made to add a direct reduction plant, supplied by Midrex Technologies, Inc. and its consortium partner, Paul Wurth. Commissioning of the world's largest single module DRI plant was completed in July 2018 and production of CDRI began in late November 2018. HDRI production, commenced in February 2019.

Iron ore pellets for use in the DRI plant are transported from the port at Arzew via a 10-km conveyor. An insulated mechanical conveyor is used to transport HDRI, typically at 600° C, from the MIDREX® Shaft Furnace to the nearby melt-shop, thus improving energy efficiency.

UNDER CONSTRUCTION

AQS to Add 2.5 Million Tons of DRI in Algeria

Construction of a 2.5 million t/y MIDREX Combination DRI Plant for Algerian Qatari Steel (AQS) continued throughout 2018. The plant, located in Bellara, Algeria, 375 km east of Algiers, will provide HDRI and CDRI to a nearby EAF melt shop, which will produce 2.0 million t/y of rebar and wire rod. The MIDREX Plant will be capable of producing HDRI and CDRI simultaneously without halting operation.

AQS was founded in 2013 as a joint venture between Qatar Steel International (49%), Algerian investment group, SIDER (46%), and the National Investment Fund of Algeria (5%). The AQS DRI Plant is scheduled for start-up in late 2019.

NEW CAPACITY AND PLANTS UNDER CONSTRUCTION

Cliffs Moves Toward Completion of Great Lakes HBI Plant

Construction of a 1.6 million t/y MIDREX HBI Plant for Cleveland-Cliffs, Inc. continued in 2018. Cleveland-Cliffs announced plans to build the plant on a brownfield site at the Port of Toledo in June of 2017. The Toledo location was chosen due to its proximity to several future customers, as well as its logistics advantages including affordable gas availability and access by multiple rail carriers.

Groundbreaking for the plant was in April of 2018. It will provide a domestic source of HBI for electric arc furnace steelmakers in the Great Lakes region when it begins operation in summer 2020.

HYL/ENERGIRON

NEW CAPACITY

No new HYL/Energiron modules began operation in 2018.

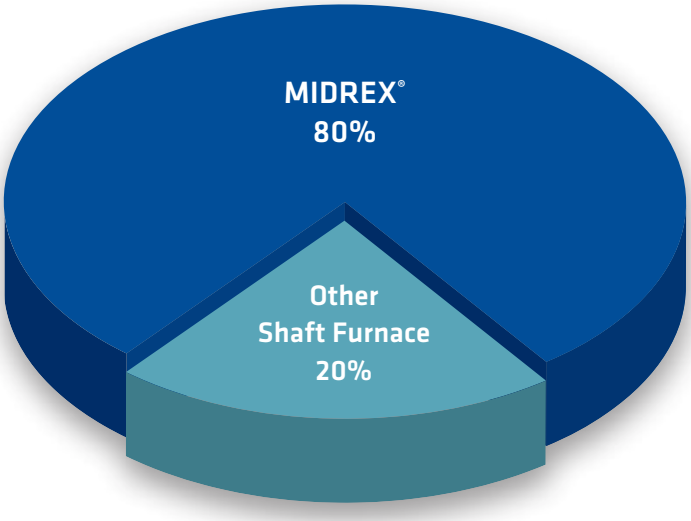
UNDER CONSTRUCTION

Tenova HYL/Energiron DRI Micro-Module Selected for Project in Bolivia

HYL/Energiron direct reduction technology will be used for the first stage of an iron & steel project for Empresa Siderúrgica del Mutún (ESM) at Puerto Suárez, Santa Cruz, Bolivia.

The 250,000 t/y Micro-Module DRI Plant is expected to be operational in mid-2021.

2018 World Shaft Furnace Production by Process



Total World Production: 100.5 Mt

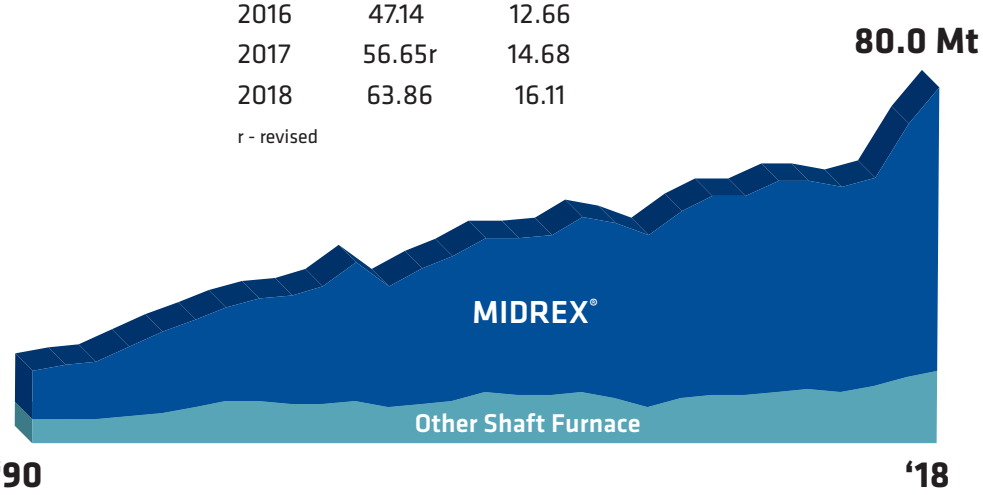
	2016	2017	2018
MIDREX®	78.8%	79.0%	79.9%
Other Shaft Furnace	21.2%	21.0%	20.1%

Source: Midrex Technologies, Inc.

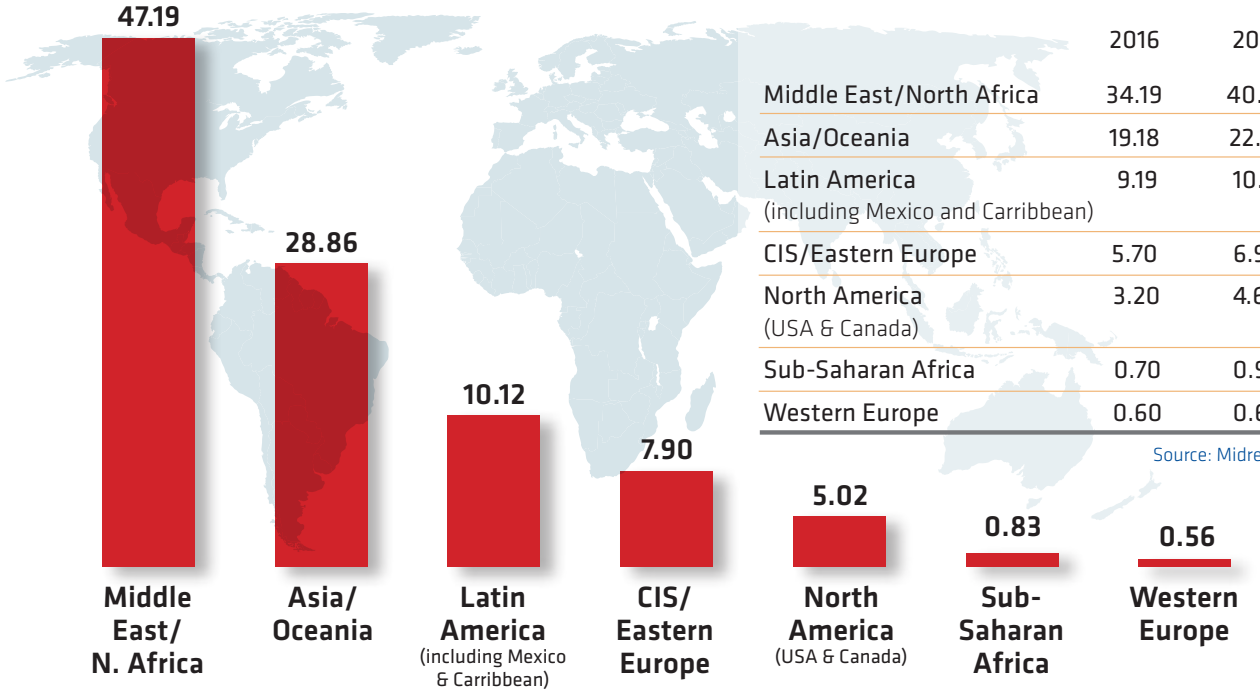
Shaft Furnace DRI Production by Process and by Year

Year	MIDREX®	Other Shaft Furnace
1990	10.73	5.25
1991	11.96	5.40
1992	13.26	5.29
1993	15.91	5.73
1994	17.83	7.01
1995	19.86	8.15
1996	21.03	9.12
1997	23.08	9.55
1998	24.82	8.52
1999	26.12	8.81
2000	30.12	9.39
2001	26.99	8.04
2002	30.11	8.88
2003	32.06	9.72
2004	35.01	11.34
2005	34.96	11.00
2006	35.71	10.91
2007	39.72	11.20
2008	39.85	9.84
2009	38.62	7.88
2010	42.01	9.81
2011	44.38	11.03
2012	44.76	10.79
2013	47.56	11.29
2014	47.12	12.04
2015	45.77	11.62
2016	47.14	12.66
2017	56.65r	14.68
2018	63.86	16.11

r - revised



2018 World DRI Production by Region (Mt)



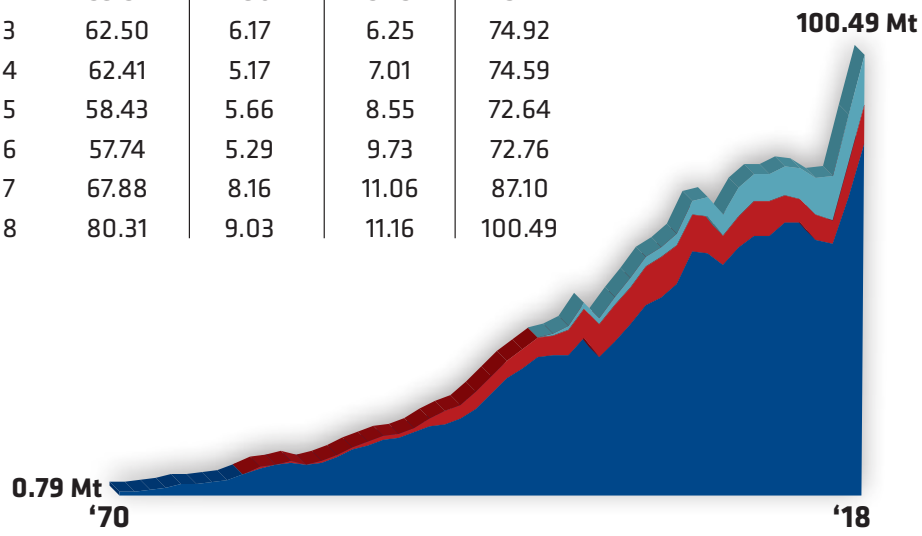
	2016	2017	2018
Middle East/North Africa	34.19	40.53	47.19
Asia/Oceania	19.18	22.91	28.86
Latin America (including Mexico and Carribbean)	9.19	10.51	10.12
CIS/Eastern Europe	5.70	6.99	7.90
North America (USA & Canada)	3.20	4.60	5.02
Sub-Saharan Africa	0.70	0.93	0.83
Western Europe	0.60	0.63	0.56

Source: Midrex Technologies, Inc.

World DRI Production by Year (Mt)

Source: Midrex Technologies, Inc.

Year	Total	Year	Total	Year	CDRI	HBI	HDRI	Total
1970	0.79	'88	14.09	'06	48.41	8.60	2.69	59.70
'71	0.95	'89	15.63	'07	55.79	8.34	2.99	67.12
'72	1.39	'90	17.68	'08	55.52	8.19	4.24	67.95
'73	1.90	'91	19.32	'09	52.54	6.93	4.86	64.33
'74	2.72	'92	20.51	'10	56.60	7.21	6.47	70.28
'75	2.81	'93	23.65	'11	59.41	7.60	6.20	73.21
'76	3.02	'94	27.37	'12	59.51	7.90	5.73	73.14
'77	3.52	'95	30.67	'13	62.50	6.17	6.25	74.92
'78	5.00	'96	33.30	'14	62.41	5.17	7.01	74.59
'79	6.64	'97	36.19	'15	58.43	5.66	8.55	72.64
'80	7.14	'98	36.96	'16	57.74	5.29	9.73	72.76
'81	7.92	'99	38.60	'17	67.88	8.16	11.06	87.10
'82	7.28	'00	43.78	'18	80.31	9.03	11.16	100.49
'83	7.90	'01	40.32					
'84	9.34	'02	45.08					
'85	11.17	'03	49.45					
'86	12.53	'04	54.60					
'87	13.52	'05	56.87					



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2018 World DRI Production by Region (Mt)

Source: Midrex Technologies, Inc.

NAME	'70-'98	'99	'00	'01	'02	'03	'04	'05	'06	'07
Latin America										
ARGENTINA	22.29	0.99	1.42	1.28	1.46	1.74	1.74	1.83	1.95	1.81
BRAZIL	6.68	0.40	0.42	0.43	0.36	0.41	0.44	0.43	0.38	0.36
MEXICO	59.99	6.24	5.83	3.67	4.90	5.62	6.54	5.98	6.17	6.26
PERU	0.86	0.05	0.08	0.07	0.03	0.08	0.08	0.09	0.14	0.09
TRINIDAD & TOBAGO	11.60	1.30	1.53	2.31	2.32	2.28	2.36	2.25	2.08	3.47
VENEZUELA	64.83	5.05	6.69	6.38	6.89	6.90	7.83	8.95	8.61	7.71
Middle East/N. Africa										
ALGERIA	–	–	–	–	–	–	–	–	–	–
BAHRAIN	–	–	–	–	–	–	–	–	–	–
EGYPT	10.36	1.67	2.11	2.37	2.53	2.87	3.02	2.90	3.10	2.79
IRAN	21.51	4.12	4.74	5.00	5.28	5.62	6.41	6.85	6.85	7.44
LIBYA	7.81	1.33	1.50	1.09	1.17	1.34	1.58	1.65	1.63	1.64
OMAN	–	–	–	–	–	–	–	–	–	–
QATAR	10.56	0.67	0.62	0.73	0.75	0.78	0.83	0.82	0.88	1.30
SAUDI ARABIA	23.52	2.36	3.09	2.88	3.29	3.29	3.41	3.63	3.58	4.34
UAE	–	–	–	–	–	–	–	–	–	–
Asia/Oceania										
AUSTRALIA	–	0.32	0.56	1.37	1.02	1.95	0.69	–	–	–
CHINA	–	0.11	0.05	0.11	0.22	0.31	0.43	0.41	0.41	0.60
INDIA	29.26r	5.22	5.44	5.59	6.59	7.67	9.37	12.04	14.74	19.06
INDONESIA	22.82	1.74	1.82	1.48	1.50	1.23	1.47	1.27	1.20	1.32
MALAYSIA	11.56	0.96	1.26	1.12	1.08	1.60	1.68	1.38	1.54	1.84
MYANMAR	0.36	0.03	0.04	0.04	0.04	0.04	0.04	–	–	–
PAKISTAN	–	–	–	–	–	–	–	–	–	–
North America										
CANADA	18.69	0.92	1.13	–	0.18	0.50	1.09	0.59	0.45	0.91
USA	12.28	1.67	1.56	0.12	0.47	0.21	0.18	0.22	0.24	0.25
CIS/Eastern Europe										
RUSSIA	20.80	1.88	1.92	2.51	2.91	2.91	3.14	3.34	3.28	3.41
Sub-Saharan Africa										
NIGERIA	1.53	–	–	–	–	–	–	–	–	0.15
SOUTH AFRICA	13.32	1.16	1.53	1.56	1.55	1.54	1.63	1.78	1.75	1.74
Western Europe										
GERMANY	8.13	0.40	0.46	0.21	0.54	0.59	0.61	0.44	0.58	0.59
Other Nations	0.47	–	–	–	–	–	–	–	–	–
WORLD TOTAL	379.23	38.59	43.80	40.32	45.08	49.48	54.60	56.87	59.70	67.12

2018 World DRI Production by Process (Mt)

NAME	'70-'98	'99	'00	'01	'02	'03	'04	'05	'06	'07
MIDREX®	229.92r	26.12	30.16	27.03	30.10	32.11	35.01	34.96	35.71	39.72
HYL/Energiron	112.71	8.81	9.39	8.04	8.88	9.72	11.34	11.00	10.91	11.20
Rotary Kiln	28.36	2.94	3.14	3.18	4.43	5.04	6.41	9.17	11.53	14.90
Other *	8.24	0.73	1.11	2.07	1.67	2.61	1.66	1.70	1.53	1.29
WORLD TOTAL	379.23	38.59	43.80	40.32	45.08	49.48	54.60	56.87	59.70	67.12

* Other: A variety of processes using retorts, shaft furnaces, fluidized bed furnaces and hearths.
e - estimated
r - revised

2018 World DRI Production by Region (Mt)

Source: Midrex Technologies, Inc.

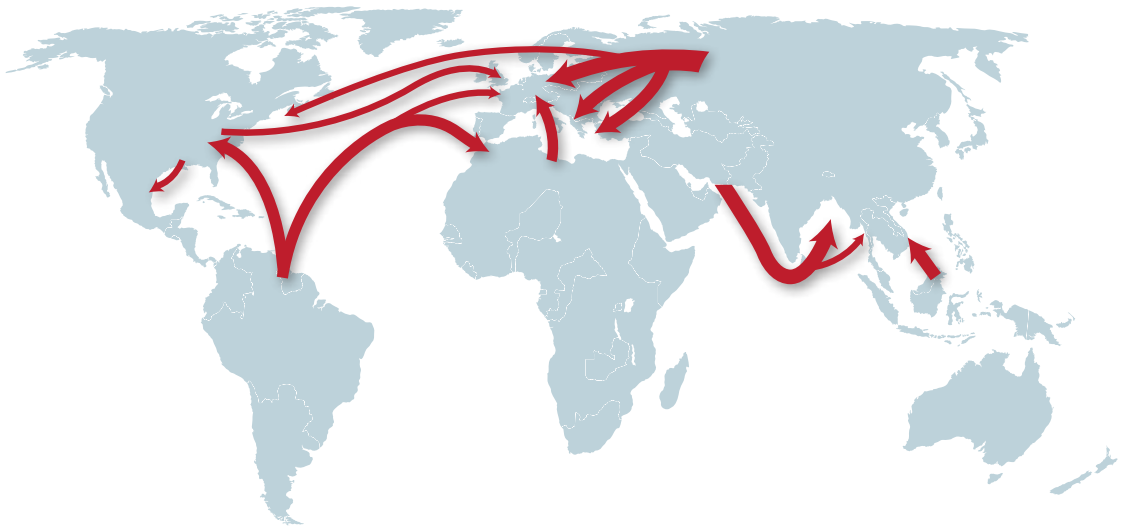
NAME	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18
Latin America											
ARGENTINA	1.86	0.81	1.57	1.68	1.61	1.54	1.67	1.26	0.78	1.23	1.61
BRAZIL	0.30	0.01	–	–	–	–	–	–	–	–	–
MEXICO	6.01	4.15	5.37	5.85	5.59	6.13	5.98	5.50	5.31	6.01	5.97e
PERU	0.07	0.10	0.10	0.09	0.10	0.10	0.09	0.07	0.01	–	–
TRINIDAD & TOBAGO	2.78	1.99	3.08	3.03	3.25	3.29	3.24	2.52	1.50	1.59	1.54
VENEZUELA	6.87	5.61	3.79	4.47	4.61	2.77	1.68	2.75	1.59	1.68	0.99
Middle East/N. Africa											
ALGERIA	–	–	–	–	–	–	–	–	–	–	0.11
BAHRAIN	–	–	–	–	–	0.78	1.44	1.23	1.26	1.26	1.60
EGYPT	2.64	2.91	2.86	2.97	2.84	3.43	2.88	2.73	2.82	4.67	5.22e
IRAN	7.46	8.20	9.35	10.37	11.58	14.46	14.55	14.55	16.01	20.55	25.75
LIBYA	1.57	1.11	1.27	0.30	0.51	0.95	1.00	0.45	0.69	0.56	0.61
OMAN	–	–	–	1.11	1.46	1.47	1.45	1.48	1.46	1.51	1.50
QATAR	1.68	2.10	2.16	2.23	2.42	2.39	2.64	2.71	2.58	2.63	2.63
SAUDI ARABIA	4.97	5.03	5.51	5.81	5.66	6.07	6.46	5.80	5.89	5.74	6.00
UAE	–	–	1.18	2.25	2.72	3.07	2.41	3.19	3.48	3.61	3.78
Asia/Oceania											
AUSTRALIA	–	–	–	–	–	–	–	–	–	–	–
CHINA	0.18	0.08	–	–	–	–	–	–	–	–	–
INDIA	21.20	22.03	23.42	21.97	20.05	17.77	17.31	17.68	18.47	22.34	28.11
INDONESIA	1.21	1.12	1.27	1.23	0.52	0.76	0.16r	0.05	–r	–	–
MALAYSIA	1.94	2.30	2.39	2.16	2.01	1.40	1.33	0.96	0.66	0.57	0.75
MYANMAR	–	–	–	–	–	–	–	–	–	–	–
PAKISTAN	–	–	–	–	–	0.06	–	–	–	–	–
North America											
CANADA	0.69	0.34	0.60	0.70	0.84	1.25	1.55	1.50	1.40	1.61	1.67
USA	0.26	–	–	–	–	–	1.30	1.10	1.81	2.99	3.35
CIS/Eastern Europe											
RUSSIA	4.56	4.67	4.79	5.20	5.24	5.33	5.35	5.44	5.70	6.99	7.90e
Sub-Saharan Africa											
NIGERIA	0.20	–	–	–	–	–	–	–	–	–	–
SOUTH AFRICA	1.18	1.39	1.12	1.41	1.57	1.41	1.55	1.12	0.70	0.93	0.83
Western Europe											
GERMANY	0.52	0.38	0.45	0.38	.56	0.50	0.57	0.55	0.60	0.63	0.56
Other Nations	–	–	–	–	–	–	–	–	–	–	–
WORLD TOTAL	67.95	64.33	70.28	73.21	73.14	74.92	74.59	72.64	72.71r	87.10	100.49

2018 World DRI Production by Process (Mt)

NAME	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18
MIDREX®	39.85	38.62	42.01	44.38	44.76	47.56	47.12	45.77	47.14	56.65r	63.86
HYL/Energiron	9.84	7.88	9.81	11.03	10.79	11.29	12.08	11.62	12.66	14.68	15.61e
Rotary Kiln	16.92	17.33	18.12	17.32	17.06	15.93	15.39	14.74	12.67r	15.34	20.31
Other *	1.33	0.76	0.34	0.48	0.53	0.14	–	0.51	0.24	0.44r	0.72
WORLD TOTAL	67.95	64.33	70.28	73.21	73.14	74.92	74.59	72.64	72.71r	87.10	100.49

* Other: A variety of processes using retorts, shaft furnaces, fluidized bed furnaces and hearths.
e - estimated
r - revised

Major Trade Routes for International Trade of DRI



The map shows the major routes of international transport of DRI in 2018. The width of the lines indicates the amount of DRI products that traveled over the individual routes. **NOTE: Domestic and smaller trade routes are not shown.**

SHIPMENTS WERE MUCH LARGER THAN IN ANY PREVIOUS YEAR AS THERE WAS A HUGE SURGE OF PRODUCTION AND DOMESTIC LAND SHIPMENT WITHIN INDIA DUE TO THE VERY PROFITABLE SITUATION FOR DRI. TOTAL SHIPMENTS WERE **GREATER THAN 21 MILLION TONS**.

SUPPLIERS

As in past years, Russia was the dominant exporter. It is believed 2018 total exports were approximately four million tons. Nearly all of this originated from the three large HBI plants at LGOK. Trinidad and Tobago exported about 1.5 million tons, all as CDRI bound for the United States. The USA and Bahrain each exported over 900,000 tons. Malaysia, Venezuela, India and Iran each exported between 600,000 and 800,000 tons. It should be noted that Iran's exports began to decline as governmental pressure was put on companies to use the iron domestically.

DESTINATIONS

ISSB data shows 48 nations that were importers of CDRI and HBI during 2018. Twenty of them purchased more than 100,000 tons. Italy imported the most, nearly 1.7 million tons and the USA was second with over 1.5 million tons. Much of the growth was seen in nations easily served from India and from the Gulf Region.

OUTLOOK

Lowered profitability caused by extraordinarily high iron ore costs are expected to limit international trade in 2019.

Data Source

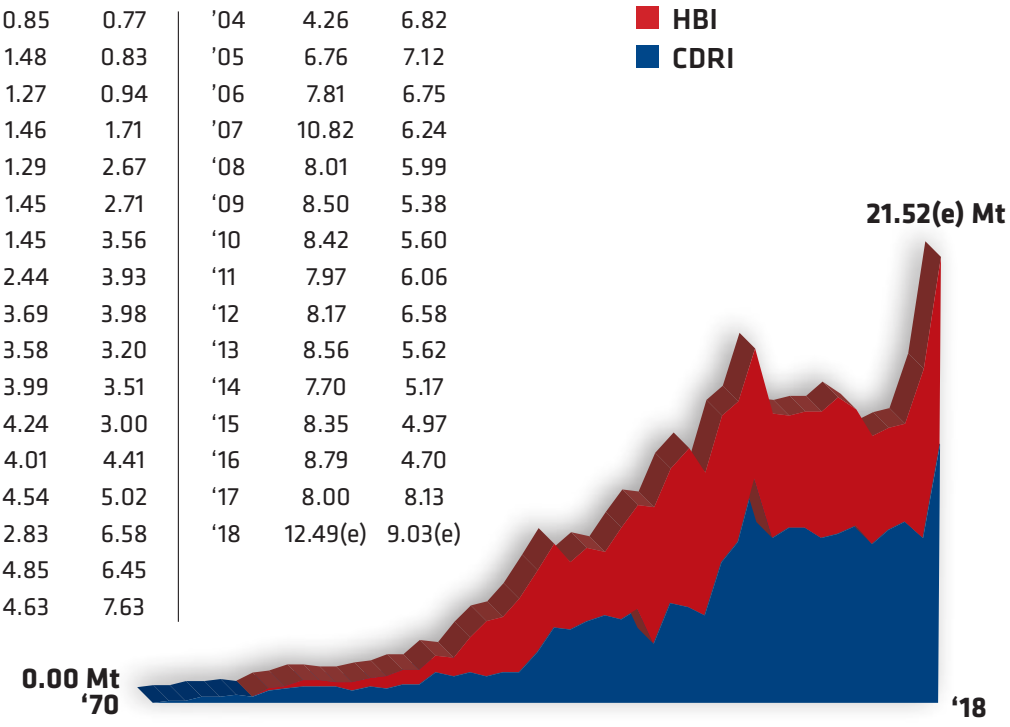
Data for the map was taken from three sources: International Steel Statistics Bureau (ISSB), International Iron Metallics Association (IIMA), and reports from individual operating DR plants. Data from the ISSB originates with national export and import records; for instance, from the US Customs Bureau. IIMA information derives from a variety of sources. It should be stressed that a significant portion of the export data does not match the import data. Also, reports from individual plants show large tonnages for which the destination is unknown.

The arrows do not originate and terminate at specific countries. Rather, sums for dispatch and arrival were totaled by region and the arrows flow from region to region. For instance, the wide arrow originating from the north coast of South America shows DRI and HBI coming from the Caribbean (Venezuela plus Trinidad and Tobago) and being transported to North America and Europe.

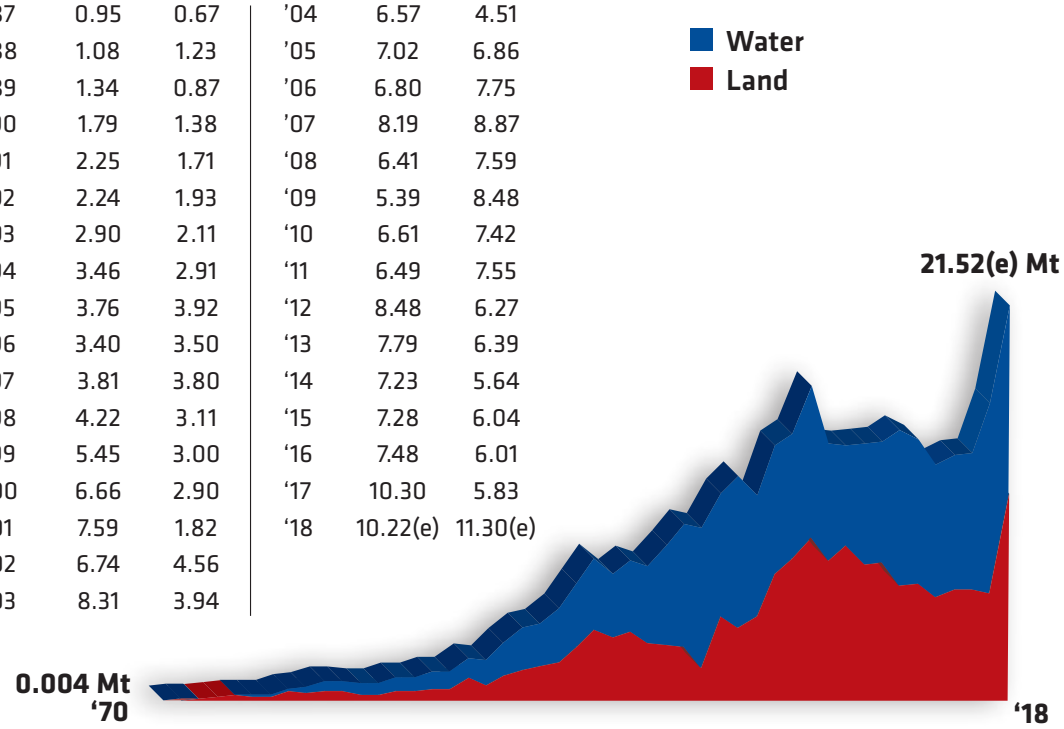
World DRI Shipments (Mt)

Source: Midrex Technologies, Inc.

Year	CDRI	HBI	Year	CDRI	HBI	Year	CDRI	HBI
1970	0.00	–	'87	0.85	0.77	'04	4.26	6.82
'71	0.04	–	'88	1.48	0.83	'05	6.76	7.12
'72	0.08	–	'89	1.27	0.94	'06	7.81	6.75
'73	0.13	–	'90	1.46	1.71	'07	10.82	6.24
'74	0.26	–	'91	1.29	2.67	'08	8.01	5.99
'75	0.34	–	'92	1.45	2.71	'09	8.50	5.38
'76	0.37	–	'93	1.45	3.56	'10	8.42	5.60
'77	0.32	–	'94	2.44	3.93	'11	7.97	6.06
'78	0.28	0.11	'95	3.69	3.98	'12	8.17	6.58
'79	0.66	0.12	'96	3.58	3.20	'13	8.56	5.62
'80	0.81	0.25	'97	3.99	3.51	'14	7.70	5.17
'81	0.83	0.25	'98	4.24	3.00	'15	8.35	4.97
'82	0.80	0.18	'99	4.01	4.41	'16	8.79	4.70
'83	0.59	0.36	'00	4.54	5.02	'17	8.00	8.13
'84	0.83	0.39	'01	2.83	6.58	'18	12.49(e)	9.03(e)
'85	0.71	0.61	'02	4.85	6.45			
'86	0.89	0.73	'03	4.63	7.63			



Year	Water	Land	Year	Water	Land	Year	Water	Land
1970	–	0.004	'87	0.95	0.67	'04	6.57	4.51
'71	–	0.04	'88	1.08	1.23	'05	7.02	6.86
'72	0.01	0.07	'89	1.34	0.87	'06	6.80	7.75
'73	0.02	0.12	'90	1.79	1.38	'07	8.19	8.87
'74	0.03	0.23	'91	2.25	1.71	'08	6.41	7.59
'75	0.06	0.28	'92	2.24	1.93	'09	5.39	8.48
'76	0.10	0.26	'93	2.90	2.11	'10	6.61	7.42
'77	0.04	0.27	'94	3.46	2.91	'11	6.49	7.55
'78	0.12	0.57	'95	3.76	3.92	'12	8.48	6.27
'79	0.33	0.45	'96	3.40	3.50	'13	7.79	6.39
'80	0.54	0.52	'97	3.81	3.80	'14	7.23	5.64
'81	0.53	0.55	'98	4.22	3.11	'15	7.28	6.04
'82	0.65	0.33	'99	5.45	3.00	'16	7.48	6.01
'83	0.67	0.28	'00	6.66	2.90	'17	10.30	5.83
'84	0.69	0.53	'01	7.59	1.82	'18	10.22(e)	11.30(e)
'85	0.81	0.51	'02	6.74	4.56			
'86	0.99	0.63	'03	8.31	3.94			



Note regarding land shipments: It is estimated that about 30% of the DRI produced in India is transported domestically to nearby melting furnaces. This tonnage is included in the figures given above.

8.5.2019

World Direct Reduction Plants

Status as of 6/30/19 Source: Midrex Technologies, Inc.

Plant	Location	Capacity (Mt/y)	Modules	Product	Start-up	Status*
MIDREX®						
ArcelorMittal Hamburg	Hamburg, Germany	0.40	1	CDRI	'71	O
ArcelorMittal Canada 1	Contrecoeur, Quebec, Canada	0.40	1	CDRI	'73	O
Tenaris Siderca	Campana, Argentina	0.40	1	CDRI	'76	O
ArcelorMittal Canada 2	Contrecoeur, Quebec, Canada	0.60	1	CDRI	'77	O
SIDOR I	Matanzas, Venezuela	0.35	1	CDRI	'77	O
Acindar	Villa Constitucion, Argentina	0.60	1	CDRI	'78	O
Qatar Steel 1	Mesaieed, Qatar	0.40	1	CDRI	'78	O
SIDOR II	Matanzas, Venezuela	1.29	3	CDRI	'79	O I I
ArcelorMittal Point Lisas I & II	Point Lisas, Trinidad & Tobago	0.84	2	CDRI	'80/'82	I
Delta Steel	Warri, Nigeria	1.02	2	CDRI	'82	I
Hadeed A & B	Al-Jubail, Saudi Arabia	0.80	2	CDRI	'82/'83	O
OEMK I - IV	Stary Oskol, Russia	1.67	4	CDRI	'83/'85/'85/'87	O
Antara Steel Mills	Labuan Island, Malaysia	0.65	1	HBI	'84	O
Khouzestan Steel Co. I - III	Ahwaz, Iran	2.05	3	CDRI	'89/'90/'92	O
EZDK I	El Dikheila, Egypt	0.72	1	CDRI	'86	O
LISCO 1 & 2	Misurata, Libya	1.10	2	CDRI	'89/'90	O
Essar Steel I & II	Hazira, India	0.88	2	HBI/HDRI	'90	O
FMO	Puerto Ordaz, Venezuela	1.00	1	HBI	'90	O
Venprecar	Matanzas, Venezuela	0.82	1	HBI	'90	O
Essar Steel III	Hazira, India	0.44	1	HBI/HDRI	'92	O
Hadeed C	Al-Jubail, Saudi Arabia	0.65	1	CDRI	'92	O
Mobarakeh Steel A - E	Mobarakeh, Iran	4.0	5	CDRI	'92/'93/'94	O
JSW Dolvi Works	Raigad, India	1.00	1	CDRI	'94	O
EZDK II	El Dikheila, Egypt	0.80	1	CDRI	'97	O
LISCO 3	Misurata, Libya	0.65	1	HBI	'97	O
ArcelorMittal Lázaro Cárdenas	Lázaro Cárdenas, Mexico	1.20	1	CDRI	'97	O
COMSIGUA	Matanzas, Venezuela	1.00	1	HBI	'98	O
ArcelorMittal Point Lisas III	Point Lisas, Trinidad & Tobago	1.36	1	CDRI	'99	I
ArcelorMittal South Africa	Saldanha Bay, South Africa	0.80	1	CDRI	'99	O
EZDK III	El Dikheila, Egypt	0.80	1	CDRI	'00	O
Khouzestan Steel IV	Ahwaz, Iran	0.85	1	CDRI	'01	O
Essar Steel IV	Hazira, India	1.00	1	HBI/HDRI	'04	O
Nu-Iron	Point Lisas, Trinidad & Tobago	1.60	1	CDRI	'06	O
Essar Steel V	Hazira, India	1.50	1	HBI/HDRI	'06	O
Mobarakeh Steel F	Mobarakeh, Iran	0.85	1	CDRI	'06	O
DRIC I & II	Dammam, Saudi Arabia	1.00	2	CDRI	'07	O
Hadeed E	Al-Jubail, Saudi Arabia	1.76	1	HDRI/CDRI	'07	O
LGOK HBI-2	Gubkin, Russia	1.40	1	HBI	'07	O
Qatar Steel 2	Mesaieed, Qatar	1.50	1	CDRI/HBI	'07	O
Khouzestan Steel V	Ahwaz, Iran	0.92	1	CDRI	'08	O
Lion DRI	Banting, Malaysia	1.54	1	HDRI/HBI	'08	I
HOSCO A & B	Bandar Abbas, Iran	1.66	2	CDRI	'09/'10	O
Essar Steel VI	Hazira, India	1.50	1	CDRI	'10	O
Khorasan Steel I	Khorasan (Mashad), Iran	0.80	1	CDRI	'10	O
JindalShadeed	Sohar, Oman	1.50	1	HDRI/HBI	'11	O

(Continued next page)

Note 1: This list does not include plants that are inoperable or that have been dismantled.
Note 2: This list only includes plants processing feed materials with total iron content of 60% or higher and producing DRI with metallization of 85% or higher.
Note 3: There are nearly 300 small rotary kilns in India with annual capacities of 10,000-30,000 tons per year that are not included on this list.
Note 4: Only a representative sample of rotary kiln facilities larger than 50,000 tons per year are shown.

*** Status Codes: O – Operating I – Idle C– Under Contract or Construction**

World Direct Reduction Plants

Status as of 6/30/19 Source: Midrex Technologies, Inc.

Plant	Location	Capacity (Mt/y)	Modules	Product	Start-up	Status*
MIDREX® *(Continued)*						
IGISCO	Ardakan (Yazd), Iran	0.80	1	CDRI	'12	O
Khorasan Steel II	Khorasan, Iran	0.80	1	CDRI	'12	O
South Kaveh Steel	Bandar Abbas, Iran	1.86	2	CDRI	'12/'13	O
Mobarakeh Steel (Kharazi A & B)	Esfahan, Iran	2.76	2	CDRI	'12/'14	O
Tuwairqi Steel Mills	Karachi, Pakistan	1.28	1	HDRI/CDRI	'13	I
SULB	Hidd, Bahrain	1.50	1	HDRI/CDRI	'13	O
Arfa Steel	Ardakan (Yazd), Iran	0.80	1	CDRI	'13	O
Mobarakeh Steel (Saba)	Esfahan, Iran	1.38	1	CDRI	'13	O
JSW Projects Ltd.	Toranagallu, Karnataka, India	1.20	1	HDRI/CDRI	'14	O
Sirjan Iranian Co.	Kerman, Iran	0.8	1	CDRI	'14	O
ESISCO	Sadat City, Egypt	1.76	1	HDRI/CDRI	'15	I
Jindal Steel & Power	Angul, India	1.80	1	HDRI/CDRI	'15	O
Sirjan Jahan Steel	Kerman, Iran	0.96	1	CDRI	'15	O
Gol-e-Gohar	Kerman, Iran	1.56	1	CDRI	'15	O
voestalpine Texas	Corpus Christi, Texas, USA	2.00	1	HBI	'16	O
Sepiddasht	Char Mahal and Bakhtiari, Iran	0.80	1	CDRI	'16	O
LGOK HBI-3	Gubkin, Russia	1.80	1	HBI	'17	O
Persian Gulf Saba	Bandar Abbas, Iran	1.50	1	HBI	'18	O
Sabzevar	Khorasan Razavi, Iran	0.80	1	CDRI	'18	O
Gol-e-Gohar II	Kerman, Iran	1.70	1	CDRI	'18	O
Tosyali Algeria	Oran, Algeria	2.50	1	HDRI/CDRI	'18	O
Chador Malu	Ardakan (Yazd), Iran	1.55	1	HDRI/CDRI	'18	O
Sirjan Iranian Co. 2	Kerman, Iran	0.90	1	CDRI	'18	O
Qaenat	South Khorasan, Iran	0.80	1	CDRI	'19	C
Algerian Qatar Steel	Bellara, Algeria	2.50	1	HDRI/CDRI	'19	C
Pasargad Steel	Shiraz, Fars, Iran	1.50	1	HDRI/CDRI	'19	C
Cleveland-Cliffs	Toledo, Ohio, USA	1.60	1	HBI	'20	C
Ardakan Steel	Ardakan (Yazd), Iran	0.96	1	CDRI	'20	C
Makran	Chabahar, Sistan-Baluchestan, Iran	1.60	1	HBI	'21	C
Torbat	Khorasan, Iran	1.85	1	CDRI	'22	C
Saqqez	Saqqez, Kurdestan, Iran	1.00	1	HBI	'22	C
		92.69	96			
HYL/ENERGIRON						
Ternium 3M5	Monterrey, Mexico	0.50	1	CDRI	'83	O
ArcelorMittal Lázaro Cárdenas I	Lázaro Cárdenas, Mexico	1.00	2	CDRI	'88	O
ArcelorMittal Lázaro Cárdenas II	Lázaro Cárdenas, Mexico	1.00	2	CDRI	'91	O
JSW Salav**	Raigad, India	0.90	1	HBI/CDRI	'93	O
PT Krakatau Steel	Cilegon, Indonesia	1.35	2	CDRI	'93	I
Perwaja Steel	Kemaman, Malaysia	1.20	2	CDRI	'93	I
Usiba	Salvador Bahia, Brazil	0.31	1	CDRI	'94	I
Ternium 2P5	Puebla, Mexico	0.61	1	CDRI	'95	O
Ternium 4M	Monterrey, Mexico	0.68	1	HDRI	'98	O
LGOK HBI-1	Gubkin, Russia	0.90	1	HBI	'99	O
Hadeed D	Al-Jubail, Saudi Arabia	1.10	1	CDRI	'99	O
Briqven	Matanzas, Venezuela	1.50	2	HBI	'00	O

** JSW Salav has two reduction furnaces but only one reformer. The reformer can supply either reduction furnace, but not simultaneously.

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World Direct Reduction Plants

Status as of 6/30/19 Source: Midrex Technologies, Inc.

Plant	Location	Capacity (Mt/y)	Modules	Product	Start-up	Status*
HYL/ENERGIRON *(Continued)*						
Gulf Sponge Iron	Abu Dhabi, UAE	0.20	1	CDRI	'10	O
Emirates Steel II (GHC)	Abu Dhabi, UAE	2.00	1	HDRI	'11	O
Suez Steel	Adabia, Egypt	1.95	1	HDRI/CDRI	'13	O
Nucor Steel Louisiana	Convent, Louisiana, USA	2.50	1	CDRI	'13	O
Ezz Rolling Mills	Ain Sukhna, Egypt	1.90	1	CDRI	'15	O
Sidor	Matanzas, Venezuela	0.80	1	CDRI	'20	C
Mutun Steel	Puerto Suarez, SC, Bolivia	0.25	1	CDRI	'21	C
		22.65	25			
OTHER						
FINMET						
BriqOri	Matanzas, Venezuela	2.20	4	HBI	'00	O
CIRCORED						
Arcelor Mittal Trinidad	Point Lisas, Trinidad & Tobago	0.50	1	HBI	'99	I
FIOR						
Operaciones RDI	Matanzas, Venezuela	0.40	1	HBI	'76	I
PERED						
Shadegan Steel	Shadegan, Khouzestan, Iran	0.80	1	CDRI	'17	O
Mianeh Steel	Mianeh, East Azerbaijan, Iran	0.80	1	CDRI	'17	O
Neyriz Steel	Neyriz, Fars, Iran	0.80	1	CDRI	'18	O
Baft Steel	Baft, Kerman, Iran	0.80	1	CDRI	'19	O
		3.20	4			
ROTARY KILN						
SL/RN						
Piratini	Charquedas, Brazil	0.06	1	CDRI	'73	I
SIIL	Paloncha, India	0.06	2	CDRI	'80/'85	O
Siderperu	Chimbote, Peru	0.10	3	CDRI	'80	I
ISCOR	Vanderbijlpark, South Africa	0.72	4	CDRI	'84	O
Prakash Industries	Champa, India	0.40	2	CDRI	'93/'96	O
Nova Iron & Steel	Bilaspur, India	0.15	1	CDRI	'94	O
Ashirwad	Jamshedpur, India	0.05	2	CDRI	'00	O
Vandana Global	Siltara, Raigarh, India	0.05	1	CDRI		O
Prakash Industry	Champa, India	0.60		CDRI		O
JINDAL						
Jindal Steel & Power	Raigarh, India	0.90	6	CDRI	'93/'94/'95/'96/'00	O
Monnet Ispat	Raipur, India	0.30	2	CDRI	'93/'98	O
Rexon Strips Ltd.	Via Lathikata, India	0.06	2	CDRI	'93/'00	O
DRC						
Scaw Metals I	Germiston, South Africa	0.18	2	CDRI	'83/'89	O
Scaw Metals II	Germiston, South Africa	0.15	1	CDRI	'97	O
Tianjin Iron & Steel	Tianjin, China	0.30	2	CDRI	'97	I

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World Direct Reduction Plants

Status as of 6/30/19 Source: Midrex Technologies, Inc.

Plant	Location	Capacity (Mt/y)	Modules	Product	Start-up	Status*
ROTARY KILN *(Continued)*						
CODIR						
Dunswart	Benoni, South Africa	0.15	1	CDRI	'73	O
Sunflag	Bhandara, India	0.15	1	CDRI	'89	O
TISCO						
Tata Sponge Iron, Ltd.	Keonjhar, Orissa, India	0.40	2	CDRI	'86/'98	O
Vallabh Steels	Ludhiana, Punjab, India	0.12	1	CDRI		O
SIIL						
Bellary Steel & Alloys	Bellary, Karnataka, India	0.06	2	CDRI	'92/'93	O
HEG	Borai, India	0.09	2	CDRI	'92	O
Kumar Met.	Nalgonda, India	0.06	2	CDRI	'93	O
Aceros Arequipa	Pisco, Peru	0.08	2	CDRI	'96	O
Rungta Mines	Barbil, India					
OSIL						
OSIL	Keonjhar, Orissa, India	0.10	1	CDRI	'83	O
Lloyd's Metals & Eng.	Ghugus, India	0.27		CDRI	'95	O
DAV						
Davsteel	Cullinan, South Africa	0.04	1	CDRI	'85	O
BGRIMM						
ArcelorMittal South Africa	Vanderbijlpark, South Africa	0.30	2	CDRI	'09	O
OTHER						
Mahalaxmi TMT Bars	Wardha, Maharashtra India	0.24	1	CDRI	'11	O
BMM Ispat Ltd	Danapura, Hospet, Karnataka, India	0.73		CDRI		O
Sarda Energy and Minerals, Ltd.	Siltara, Raipur, India	0.36		CDRI		O
Godawari Power and Ispat	Siltara, Raipur, India	0.5		CDRI		O
Nalwa Steel and Power Ltd.	Raigarh, Chhattisgarh, India	0.18		CDRI		O
Janki Corp., Ltd.	Sidiginamola, Bellary, Karnataka	0.18		CDRI		O
Andhunik Metaliks, Ltd.	Chadrihariharpur, Orissa, India	0.3		CDRI		O
Shyam SEL Ltd.	West Bengal and Odisha, India	0.8		CDRI		O
Shri Bajrang Power and Ispat	Raipur, India	0.36		CDRI		O
Gallantt Metal, Ltd.	Kutch, Gujarat, India	0.2		CDRI		O
SKS Ispat, Ltd.	Raipur, Chhattisgarh, India	0.27		CDRI		O
Bhushan Power and Steel Ltd.	Sambalpur, Odisha, India	1.5		CDRI	11-'12	O
Bhushan Steel Ltd.	Angul, Odisha, India	1.5		CDRI		O
Electrotherm (India) Ltd.	Kutch, Gujarat, India	0.15		CDRI		O
Jayaswal Neco Industries Ltd.	Raipur, Chhattisgarh	0.25		CDRI		O
SMC Power Generation Ltd.	Jharsuguda, Odisha, India	0.2		CDRI		O
Electrotherm	Kutch, India	0.18		CDRI		O
PT Meratus Jaya	Kalimantan Selatan, Indonesia	0.32		CDRI		O

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2018 WORLD DIRECT REDUCTION STATISTICS is compiled by Midrex Technologies, Inc. annually as a resource for the global iron and steel industry.

Direct reduced iron (DRI) is a high quality metallic product produced from iron ore that is used as a feedstock in electric arc furnaces, blast furnaces and other iron and steelmaking applications. Hot briquetted iron (HBI) is a compacted form of DRI designed for ease of shipping, handling, and storage.

Midrex Technologies, Inc. is the world leader for direct reduction ironmaking technology and aftermarket solutions for the steel industry. As the technology provider of the MIDREX® Process for 50+ years, Midrex designs Direct Reduced Iron (DRI) plants, providing engineering, proprietary equipment, and project development services. The MIDREX® Process is unsurpassed in the industry in terms of production and process flexibility to meet the constantly evolving nature of steelmakers and ore-based metallics providers.

The following organizations supplied or assisted in collecting data for this issue of 2018 WORLD DIRECT REDUCTION STATISTICS:

Sponge Iron Manufacturers Association – India
World Steel Association – Belgium
International Iron Metallics Association – UK
South East Asia Iron and Steel Institute – Malaysia
International Steel Statistics Bureau – UK
Kobe Steel Ltd. – Japan
All Individual MIDREX® Direct Reduction Plants
Other Direct Reduction Plants
Various company corresondence

For updates check **www.midrex.com**
For more information or general comments, please e-mail: **info@midrex.com**

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***World Steel Dynamics (WSD)** has audited Midrex's collection and preparation process of the "2018 World Direct Reduction Statistics", i.e. "The Booklet". It is our observation that at the present, Midrex receives inputs from all over the world from practically every known direct reduction producer either directly or indirectly through partner organizations. Midrex invites all producers to participate directly. In instances where plant information is not available directly from producers, Midrex deduces that information from publicly available data. WSD has reviewed the data collection and preparation procedures and can confirm the documentation substantiates the methodology and accuracy of the data to be published in The Booklet for the world direct reduction industry in 2018.*

Audited by
WSD WORLD STEEL DYNAMICS®
Englewood Cliffs, New Jersey, U.S.A.
July, 2019

MIDREX