2017

WORLD DIRECT REDUCTION STATISTICS

MIDREX

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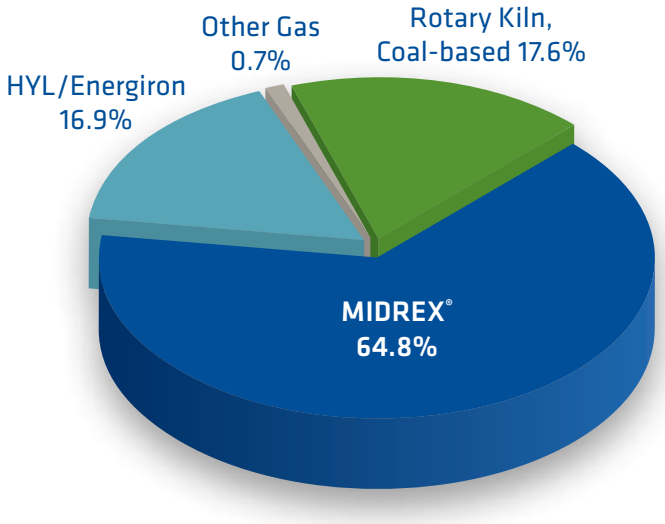
CONTENTS

Audited by WSD WORLD STEEL DYNAMICS®

5.24.18

2017 World DRI Production by Process



Total World Production: 87.1 Mt

	2015	2016	2017
MIDREX®	63.1%	64.8%	64.8%
HYL/Energiron	16.0%	17.4%	16.9%
Other Gas	0.7%	0.3%	0.7%
Rotary Kiln, Coal-based	20.2%	17.5%	17.6%

Source: Midrex Technologies, Inc.

New Plants, Improved Conditions Boost World DRI Production by 20% in 2017

World DRI production increased by more than 14 million metric tons (tons) over 2016, exceeding 87 million tons in 2017, according to data collected by Midrex Technologies, Inc. and audited by World Steel Dynamics. This significant increase is credited to the impact of new plants in Iran, Russia and the USA, as well as improved conditions in Egypt and India. The outstanding production results were achieved despite problems that continue to severely limit the Venezuelan DR plants, which represent a total of 8.6 million tons of installed DRI and HBI capacity.

Iran reported more than 20.5 million tons of DRI production in 2017. This was an increase of 4.5 million tons over 2016, credited primarily to the start-up of new plants.

In 2017, India's imported LNG prices were the lowest in recent years. As a result, DRI production increased by 3.9 million tons over 2016, totaling more than 22.3 million tons. Rotary kilns accounted for almost 14.8 million tons of Indian DRI production, while natural gas-based plants made about 7.5 million tons.

Tonnage of DRI/HBI shipped within India is estimated to comprise 20% of 2017 total production.

Russia's Metalloinvest launched its third hot briquetted iron (HBI) production facility (HBI-3 Plant) at Lebedinsky GOK in Gubkin, Belgorod region, in 2017. The HBI-3 Plant has a design capacity of 1.8 million tons/year, which increases Metalloinvest's installed annual HBI production capability to 4.1 million tons and reinforces its leading position in the global merchant HBI market.

The first HBI plant in the United States, located outside of Corpus Christi, Texas and owned by voestalpine Texas LLC, ramped up production in 2017, following start-up on September 27, 2016. Within little more than 24 hours of start-up, the plant was in stable operation at around 160 metric tons per hour producing on-grade briquettes.

Market conditions in Egypt improved greatly in 2017, which led to an increased demand for iron and steel products. DRI production was up 1.85 million tons over 2016; however, DR plants overall continue to operate under capacity.

BEHIND THE NUMBERS

The greatest increases in DRI production were seen in Iran and India. Iran produced 20.5 million tons of DRI/HBI in 2017, up 28.3% year-on-year. Iran ended 2017 as the world's 13th largest steelmaker with a total output of 21.72 million tons, up 21.4% YOY. Gas-based production of DRI/HBI increased by 22% in India, as compared to 2016. Another reason for India's increase in gas-based production is stabilization of Corex syngas and coal gas based DRI/HBI plants. The production of coal-based DRI also eclipsed 2016 output by 20%. Overall, Indian DRI/HBI production in 2017 was up by 21%. Egypt, Russia, and the USA also enjoyed significant gains. In Egypt, gas supplies improved as a reflection of a general economic upswing. In Russia, the third HBI plant at Metalloinvest's LGOK subsidiary settled into its first full year of production in 2017. Likewise, the voestalpine Texas HBI plant, which was started up in late 2016, continued to ramp up production throughout the year.

Although a few countries reported decreased production in 2017, most producing nations experienced at least modest increases.

Venezuela's iron & steel industry continued to struggle in 2017, with DRI/HBI production totaling only 1.68 million tons, which is well below the country's installed capacity. The limited production was due to many reasons, all of which are the result of the dire economic conditions of the country. The Nu-Iron Plant in Trinidad and Tobago, owned by Nucor Steel, continued its steady operation, supplying CDRI to Nucor's steel works in the United States.

The five countries included in the table below accounted for over 70% of total world direct reduced iron production in 2017.

2017 Top Producing Nations

	Million Tons
India	22.34
Iran	20.55
Russia	6.99
Mexico	6.01
Saudi Arabia	5.74

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

It should be noted that almost two-thirds of the DRI made in India is produced in rotary kilns, which employ coal as the reductant and fuel. For this reason, Iran is the number one producer of gas-based DRI.

NEW CAPACITY AND PLANTS UNDER CONSTRUCTION

MIDREX®

World´s largest single module HBI plant completes Performance Guarantee Test

The 2.0 million metric ton per year **MIDREX® HBI plant** at voestalpine Texas LLC passed its performance test in early February of 2017. The voestalpine Texas **MIDREX® HBI plant** is both the largest single module of its kind in the world, as well as North America's first merchant HBI facility.

voestalpine Texas MIDREX® HBI Plant located near Corpus Christi, Texas, is the world's largest HBI plant.

The Performance Guarantee Test (PGT) began on January 29, 2017. Measurements included HBI production, HBI physical and chemical characteristics, the plant's key natural gas and electricity consumption, water quality measurements and environmental / emissions impacts. The plant achieved 100% of tested performance guarantee parameters during the first attempt of the PGT.

The plant plays an important step in the voestalpine Group's internal energy efficiency and climate protection program. Around half of the planned two million tons of HBI will be supplied to the Austrian steel plants in Linz and Donawitz. The other half will be sold to companies interested in a supply of HBI over the long term.

Russia's largest HBI plant completes Performance Guarantee Test

HBI-3, the newest **MIDREX® HBI plant** at Lebedinsky Mining and Processing Integrated Works (LGOK), completed its 7-day Performance Guarantee Test in mid-May of 2017. The plant has a design capacity of 1.8 million tons of HBI per year and increases Metalloinvest's annual HBI production capacity to 4.1 million tons.

HBI-3 began commissioning in early 2017 and first product was made on March 11, 2017. Preliminary acceptance was received on March 15, and the PGT was successfully completed on the first attempt on May 13. The plant received its Performance Test Certificate on June 13, 2017. Test parameters included HBI production, HBI physical and chemical characteristics, the plant's key natural gas and electricity consumption and environmental/emissions impacts.

LGOK HBI-3 Plant, located in Gubkin, Russia, has a design capacity of 1.8 million tons of HBI per year.

Cliffs announces plans for Great Lakes HBI plant

Cleveland-Cliffs, Inc. announced in June of 2017, plans to build a 1.6 million tons/year **MIDREX® HBI Plant** in Toledo, Ohio, USA. The brownfield site at the Port of Toledo is considered a prime location due to its proximity to several future customers, as well as its logistics advantages, including affordable gas availability and access by multiple rail carriers.

NEW CAPACITY AND PLANTS UNDER CONSTRUCTION

Cliffs broke ground for the plant 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 2020.

Cleveland-Cliffs located in Toledo, Ohio, is currently under construction and will begin operation in 2020.

Construction Update - 5 Million Tons of DRI in Algeria

The world's largest multiple product DRI plant is being built for Tosyali Algeria in Bethioua (Oran), Algeria. The **MIDREX® Combination DRI Plant** will provide Tosyali greater flexibility in producing high quality, low impurity steels and will decrease the need for costly imported scrap.

The 2.5 million tons/year DRI plant will be capable of varying production between HDRI and CDRI simultaneously without stopping the plant. The Tosyali Algeria DRI plant is expected to be started up in the second half of 2018.

Another 2.5 million tons/year **MIDREX® Combination DRI Plant** is under construction for Algerian Qatari Steel (AQS). The plant, located in Bellara, Algeria, 375 km east of Algiers. Is part of a new steel complex that will produce 2.0 million tons of rebar and wire rod. It will be capable of producing HDRI and CDRI simultaneously on-demand without halting operation.

The AQS DRI Plant is scheduled for start-up in 2019.

HYL/ENERGIRON

New modules

No new HYL/Energiron modules began operation in 2017.

Under Construction

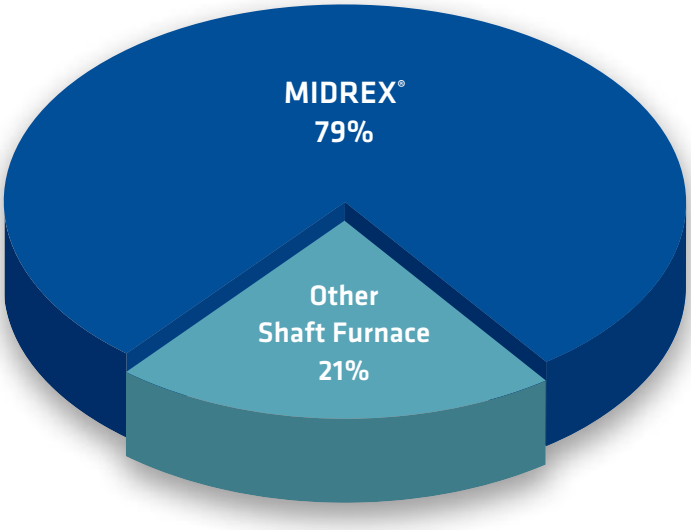
The only HYL/Energiron module under construction is the 800,000 tons/year CDRI plant for Sidor in Matanzas, Venezuela. Construction began nearly a decade ago but has been much delayed due to the country's economic situation

ROTARY KILN COAL-BASED

Worldwide DRI production by rotary kiln plants increased by more than 21% in 2017, to greater than 15 million tons. Production in India increased by 20%, due to the restart of idled plants in response to increased demand and improved prices.

There are over 200 kilns operating in the world, most of which are in India.

2017 World Shaft Furnace Production by Process



Total World Production: 71.4 Mt

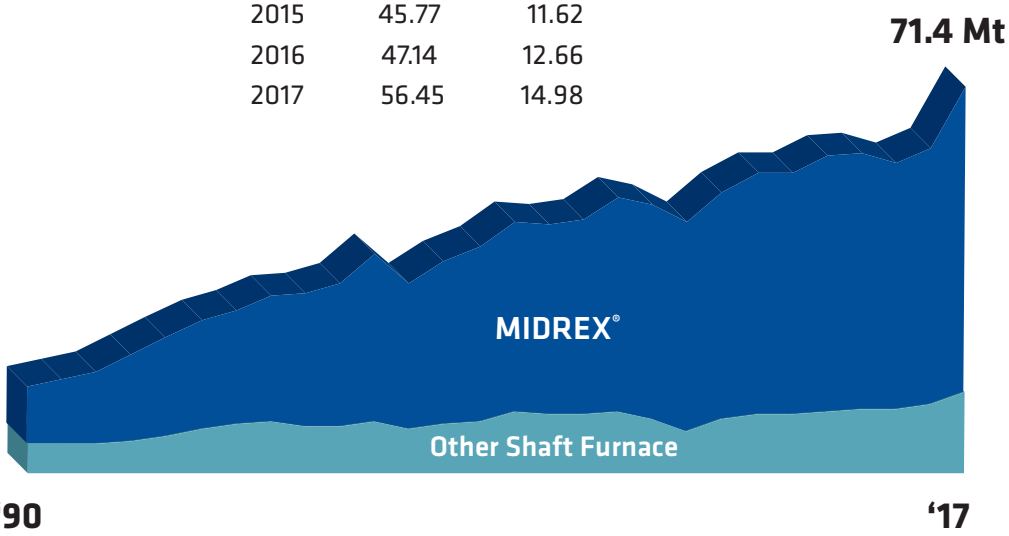
	2015	2016	2017
MIDREX®	79.7%	78.8%	79.0%
Other	20.3%	21.2%	21.0%

Source: Midrex Technologies, Inc.

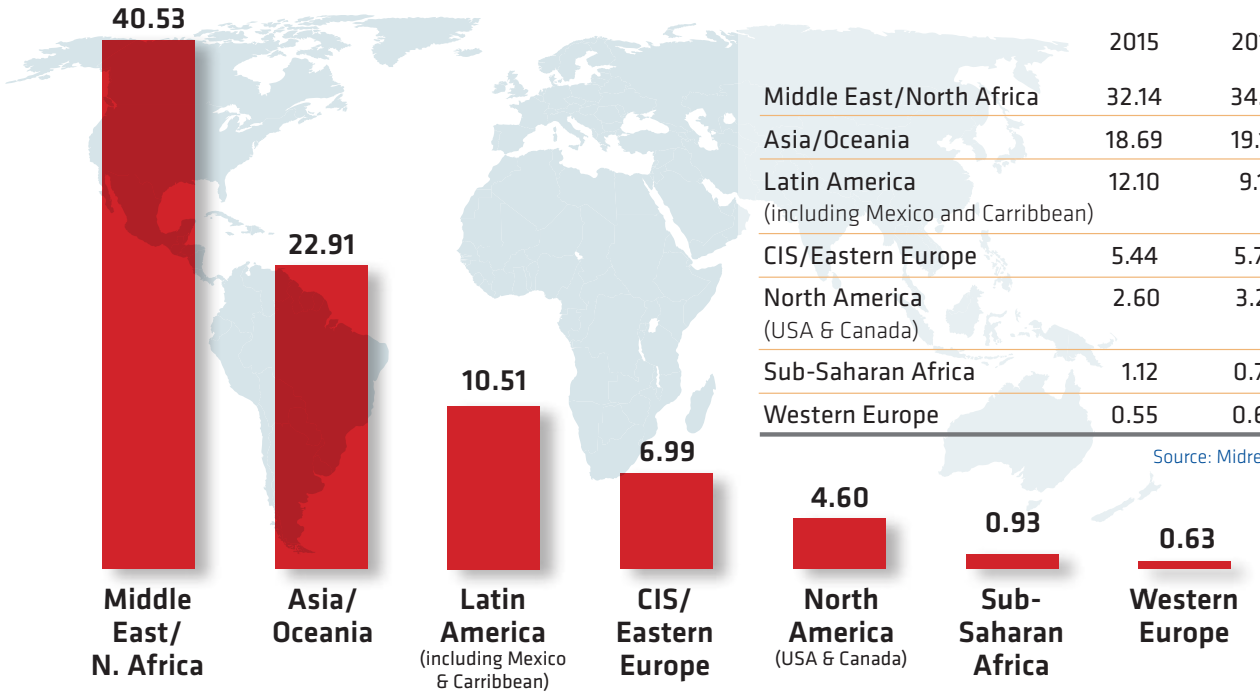
Shaft Furnace DRI Production by Process and by Year

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

Year	MIDREX®	Other Shaft Furnace
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	56.45	14.98



2017 World DRI Production by Region (Mt)



	2015	2016	2017
Middle East/North Africa	32.14	34.19	40.53
Asia/Oceania	18.69	19.18	22.91
Latin America (including Mexico and Carribbean)	12.10	9.19	10.51
CIS/Eastern Europe	5.44	5.70	6.99
North America (USA & Canada)	2.60	3.20	4.60
Sub-Saharan Africa	1.12	0.70	0.93
Western Europe	0.55	0.60	0.63

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					
'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					

2017 World DRI Production by Region (Mt)

Source: Midrex Technologies, Inc.

NAME	'70-'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
Latin America										
ARGENTINA	20.75	1.54	0.99	1.42	1.28	1.46	1.74	1.74	1.83	1.95
BRAZIL	6.34	0.34	0.40	0.42	0.43	0.36	0.41	0.44	0.43	0.38
MEXICO	54.31	5.68	6.24	5.83	3.67	4.90	5.62	6.54	5.98	6.17
PERU	0.75	0.11	0.05	0.08	0.07	0.03	0.08	0.08	0.09	0.14
TRINIDAD & TOBAGO	10.46	1.14	1.30	1.53	2.31	2.32	2.28	2.36	2.25	2.08
VENEZUELA	59.77	5.06	5.05	6.69	6.38	6.89	6.90	7.83	8.95	8.61
Middle East/N. Africa										
BAHRAIN	–	–	–	–	–	–	–	–	–	–
EGYPT	8.75	1.61	1.67	2.11	2.37	2.53	2.87	3.02	2.90	3.10
IRAN	17.82	3.69	4.12	4.74	5.00	5.28	5.62	6.41	6.85	6.85
LIBYA	6.80	1.01	1.33	1.50	1.09	1.17	1.34	1.58	1.65	1.63
OMAN	–	–	–	–	–	–	–	–	–	–
QATAR	9.85	0.71	0.67	0.62	0.73	0.75	0.78	0.83	0.82	0.88
SAUDI ARABIA	21.25	2.27	2.36	3.09	2.88	3.29	3.29	3.41	3.63	3.58
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
INDIA	24.04	5.26	5.22	5.44	5.59	6.59	7.67	9.37	12.04	14.74
INDONESIA	21.18	1.64	1.74	1.82	1.48	1.50	1.23	1.47	1.27	1.20
MALAYSIA	10.65	0.91	0.96	1.26	1.12	1.08	1.60	1.68	1.38	1.54
MYANMAR	0.32	0.04	0.03	0.04	0.04	0.04	0.04	0.04	–	–
PAKISTAN	–	–	–	–	–	–	–	–	–	–
North America										
CANADA	17.45	1.24	0.92	1.13	–	0.18	0.50	1.09	0.59	0.45
USA	10.68	1.60	1.67	1.56	0.12	0.47	0.21	0.18	0.22	0.24
CIS/Eastern Europe										
RUSSIA	19.25	1.55	1.88	1.92	2.51	2.91	2.91	3.14	3.34	3.28
Sub-Saharan Africa										
NIGERIA	1.53	–	–	–	–	–	–	–	–	–
SOUTH AFRICA	12.27	1.05	1.16	1.53	1.56	1.55	1.54	1.63	1.78	1.75
Western Europe										
GERMANY	7.68	0.45	0.40	0.46	0.21	0.54	0.59	0.61	0.44	0.58
Other Nations	0.47	–	–	–	–	–	–	–	–	–
WORLD TOTAL	342.33	36.90	38.59	43.80	40.32	45.08	49.48	54.60	56.87	59.70

2017 World DRI Production by Process (Mt)

NAME	'70-'97	'98	'99	'00	'01	'02	'03	'04	'05	'06
MIDREX®	204.97	24.82	26.12	30.16	27.03	30.10	32.11	35.01	34.96	35.71
HYL/Energiron	104.19	8.52	8.81	9.39	8.04	8.88	9.72	11.34	11.00	10.91
Fluidized Bed Processes	6.75	0.40	0.66	0.96	1.93	1.63	2.57	1.62	1.52	1.31
Rotary Kiln, Coal-based	25.42	2.94	2.94	3.14	3.18	4.43	5.04	6.41	9.17	11.53
Other Processes*	1.00	0.09	0.07	0.15	0.14	0.04	0.04	0.04	0.18	0.22
WORLD TOTAL	342.33	36.90	38.59	43.80	40.32	45.08	49.48	54.60	56.87	59.70

* Other Processes: A variety of processes using retorts, shaft furnaces and hearths that have had limited commercial success.

2017 World DRI Production by Region (Mt)

Source: Midrex Technologies, Inc.

NAME	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17
Latin America											
ARGENTINA	1.81	1.86	0.81	1.57	1.68	1.61	1.54	1.67	1.26	0.78	1.23
BRAZIL	0.36	0.30	0.01	–	–	–	–	–	–	–	–
MEXICO	6.26	6.01	4.15	5.37	5.85	5.59	6.13	5.98	5.50	5.31	6.01
PERU	0.09	0.07	0.10	0.10	0.09	0.10	0.10	0.09	0.07	0.01	–
TRINIDAD & TOBAGO	3.47	2.78	1.99	3.08	3.03	3.25	3.29	3.24	2.52	1.50	1.59
VENEZUELA	7.71	6.87	5.61	3.79	4.47	4.61	2.77	1.68	2.75	1.59	1.68
Middle East/N. Africa											
BAHRAIN	–	–	–	–	–	–	0.78	1.44	1.23	1.26	1.26
EGYPT	2.79	2.64	2.91	2.86	2.97	2.84	3.43	2.88	2.73	2.82	4.67
IRAN	7.44	7.46	8.20	9.35	10.37	11.58	14.46	14.55	14.55	16.01	20.55
LIBYA	1.64	1.57	1.11	1.27	0.30	0.51	0.95	1.00	0.45	0.69	0.56
OMAN	–	–	–	–	1.11	1.46	1.47	1.45	1.48	1.46	1.51
QATAR	1.30	1.68	2.10	2.16	2.23	2.42	2.39	2.64	2.71	2.58	2.63
SAUDI ARABIA	4.34	4.97	5.03	5.51	5.81	5.66	6.07	6.46	5.80	5.89	5.74
UAE	–	–	–	1.18	2.25	2.72	3.07	2.41	3.19	3.48	3.61
Asia/Oceania											
AUSTRALIA	–	–	–	–	–	–	–	–	–	–	–
CHINA	0.60	0.18	0.08	–	–	–	–	–	–	–	–
INDIA	19.06	21.20	22.03	23.42	21.97	20.05	17.77	17.31	17.68	18.47	22.34
INDONESIA	1.32	1.21	1.12	1.27	1.23	0.52	0.76	0.16r	0.05	–r	–
MALAYSIA	1.84	1.94	2.30	2.39	2.16	2.01	1.40	1.33	0.96	0.66	0.57
MYANMAR	–	–	–	–	–	–	–	–	–	–	–
PAKISTAN	–	–	–	–	–	–	0.06	–	–	–	–
North America											
CANADA	0.91	0.69	0.34	0.60	0.70	0.84	1.25	1.55	1.50	1.40	1.61
USA	0.25	0.26	–	–	–	–	–	1.30	1.10	1.81	2.99
CIS/Eastern Europe											
RUSSIA	3.41	4.56	4.67	4.79	5.20	5.24	5.33	5.35	5.44	5.70	6.99
Sub-Saharan Africa											
NIGERIA	0.15	0.20	–	–	–	–	–	–	–	–	–
SOUTH AFRICA	1.74	1.18	1.39	1.12	1.41	1.57	1.41	1.55	1.12	0.70	0.93
Western Europe											
GERMANY	0.59	0.52	0.38	0.45	0.38	.56	0.50	0.57	0.55	0.60	0.63
Other Nations	–	–	–	–	–	–	–	–	–	–	–
WORLD TOTAL	67.12	67.95	64.33	70.28	73.21	73.14	74.92	74.59	72.64	72.71r	87.10

2017 World DRI Production by Process (Mt)

NAME	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17
MIDREX®	39.72	39.85	38.62	42.01	44.38	44.76	47.56	47.12	45.77	47.14	56.45
HYL/Energiron	11.20	9.84	7.88	9.81	11.03	10.79	11.29	12.08	11.62	12.66	14.68
Fluidized Bed Processes	1.05	1.08	0.50	0.34	0.48	0.53	0.14	–	0.51	0.24	0.63
Rotary Kiln, Coal-based	14.90	16.92	17.33	18.12	17.32	17.06	15.93	15.39	14.74	12.67r	15.34
Other Processes*	0.24	0.25	0.26	–	–	–	–	–	–	–	–
WORLD TOTAL	67.12	67.95	64.33	70.28	73.21	73.14	74.92	74.59	72.64	72.71r	87.10

* Other Processes: A variety of processes using retorts, shaft furnaces and hearths that have had limited commercial success.
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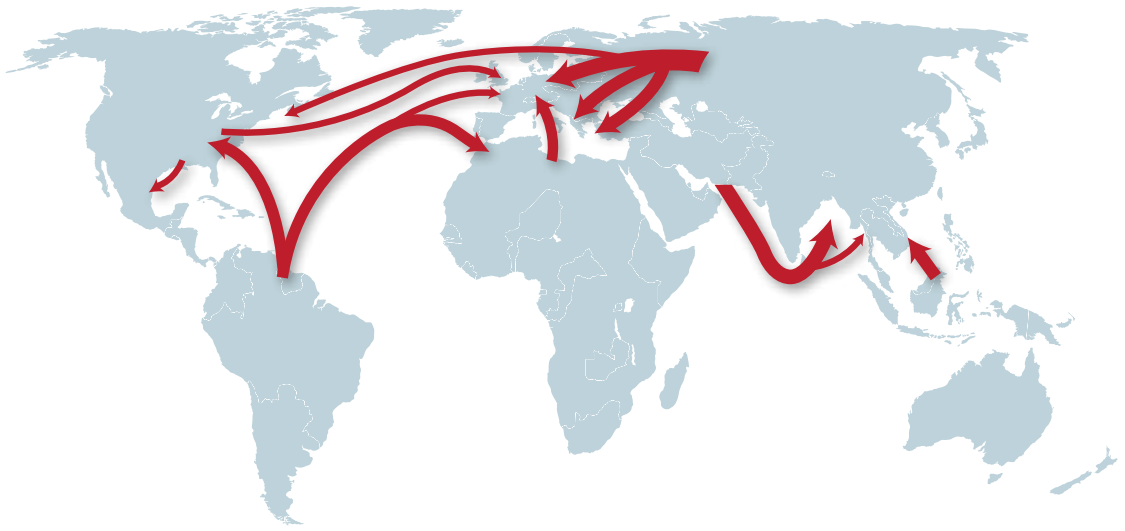
Major Trade Routes for International Trade of DRI



The map shows the major routes of international transport of DRI in 2017. 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.

TOTAL DRI/HBI SHIPMENTS IN 2017 WERE **16.13 MILLION TONS**, THE **SECOND HIGHEST EVER**. IN 2007, SHIPMENTS WERE 17.06 MILLION TONS.

SUPPLIERS

Russia continued to be the dominant source of supply, exporting more than 3.3 million tons of HBI to buyers worldwide. The next largest shipper, Trinidad and Tobago, was represented entirely by Nu-Iron, as the ArcelorMittal plants at Point Lisas remained idle in 2017. Venezuela, historically one of the leading suppliers of HBI, managed to ship only 1.2 million tons, far below its installed capacity. With the ramp up of production by the voestalpine Texas HBI plant, the United States became a source of merchant supply. Shipments from the plant were split between North American and international customers, primarily the Austrian blast furnaces of voestalpine.

DESTINATIONS

The USA, Italy and Turkey were the largest customers for DRI products in 2017. Combined, they imported about 40% of the total international trade. The list of countries importing at least 100,000 tons increased to 19, according to the International Steel Statistics Bureau (ISSB) data.

OUTLOOK

With two large HBI plants reaching full production, voestalpine Texas in the USA and LGOK HBI-3 in Russia, as well as DRI and HBI plants in Trinidad and Tobago and in the MENA region that export a portion of their production, trade is likely to further increase in 2018.

It should be noted that exports of DRI products from Iran increased significantly during 2017, which has resulted in the Iranian government banning exports in favor of domestic use of the DRI and HBI for steel production.

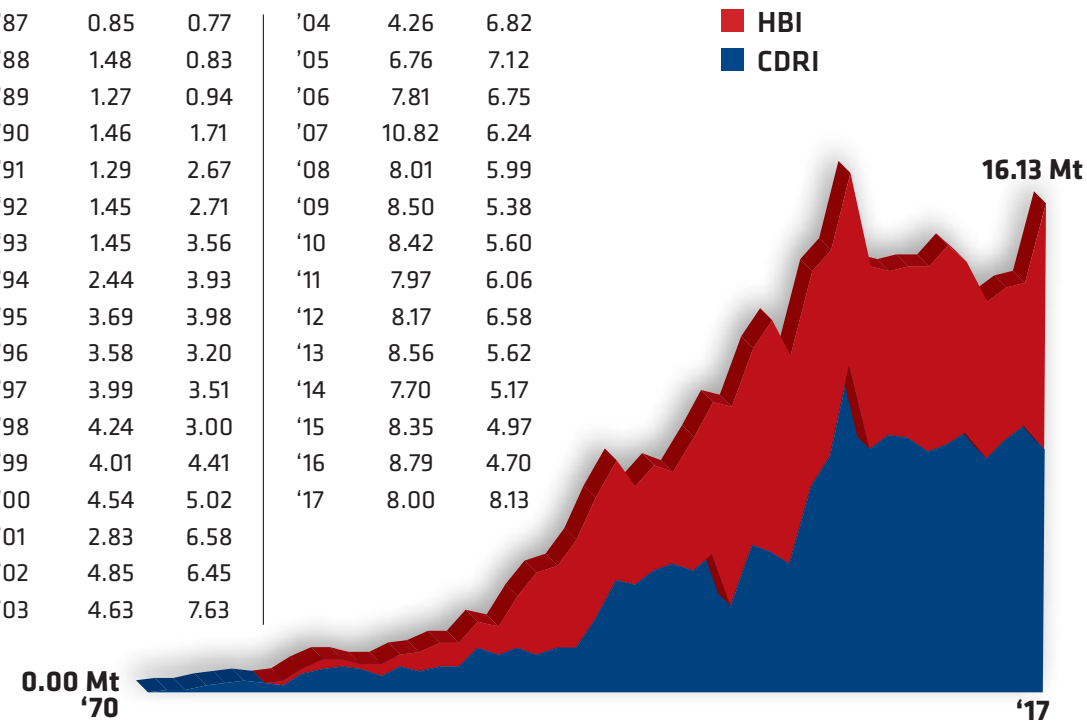
Data for the map was taken from three sources:
International Steel Statistics Bureau (ISSB), International Iron Metallics Association (IIMA), and reports from individual operating DR plants. Data from the ISSB originates with national export and import records; for instance, from the US Customs Bureau. 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.

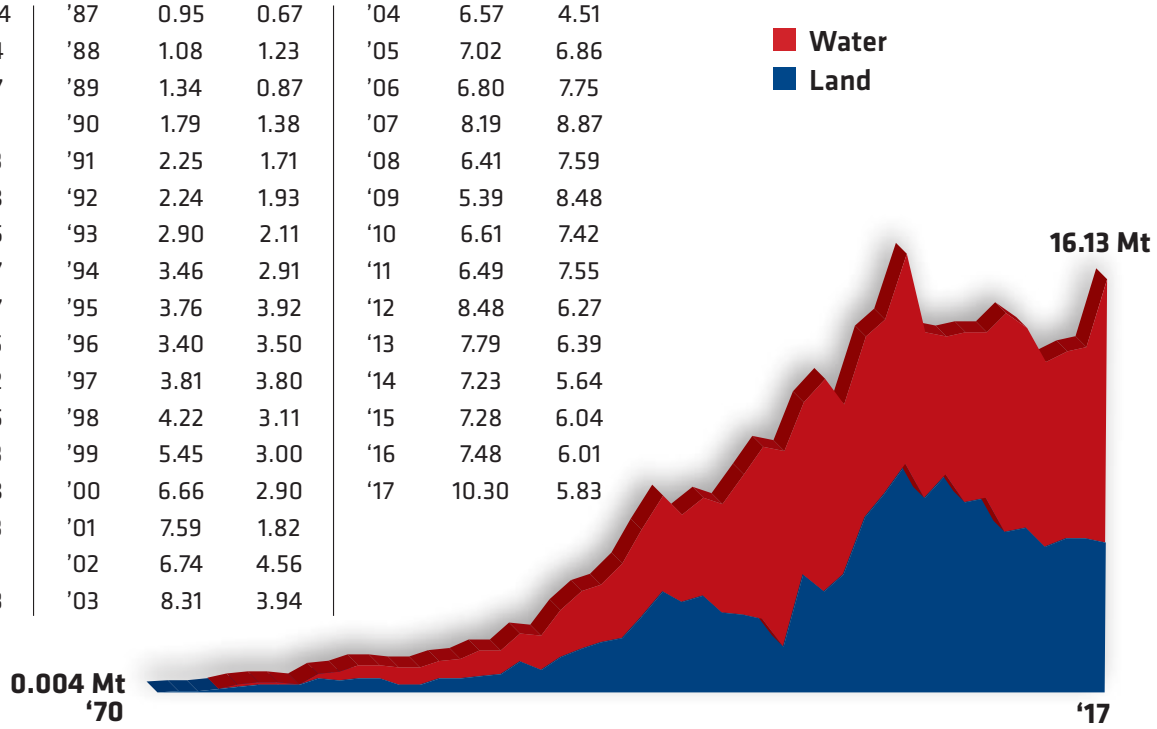
World DRI Shipments (Mt)

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			
'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			
'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.

World Direct Reduction Plants

Status as of 5/15/18 Source: Midrex Technologies, Inc.

Plant	Location	Capacity (Mt/y)	Modules	Product	Start-up	Status*
SHAFT FURNACE TECHNOLOGY						
MIDREX® PROCESS						
ArcelorMittal Hamburg	Hamburg, Germany	0.40	1	CDRI	'71	O
ArcelorMittal Contrecoeur-East 1	Contrecoeur, Quebec, Canada	0.40	1	CDRI	'73	O
Tenaris Siderca	Campana, Argentina	0.40	1	CDRI	'76	O
ArcelorMittal Contrecoeur-East 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 I	Mesaieed, Qatar	0.40	1	CDRI	'78	O
SIDOR II	Matanzas, Venezuela	1.29	3	CDRI	'79	O O I
ArcelorMittal Point Lisas I & II	Point Lisas, Trinidad & Tobago	0.84	2	CDRI	'80/'82	I
Premium 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 - IV	Ahwaz, Iran	1.84	4	CDRI	'89/'90/'92/'01	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	I O
FMO	Puerto Ordaz, Venezuela	1.00	1	HBI	'90	O
Briqcar	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	3.20	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
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	0.80	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 II	Mesaieed, Qatar	1.50	1	CDRI/HBI	'07	O
Khouzestan Steel V	Ahwaz, Iran	0.80	1	CDRI	'08	O
Lion DRI	Banting, Malaysia	1.54	1	HDRI/HBI	'08	I
HOSCO I & II	Bandar Abbas, Iran	1.65	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
Jindal Shadeed	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 over 200 small rotary kilns in India with annual capacities of 10,000-30,000 tons per year that are not included on this list. The total capacity of all rotary kilns in India is estimated to be 19.5 Mt/y.
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 5/15/18 Source: Midrex Technologies, Inc.

Plant	Location	Capacity (Mt/y)	Modules	Product	Start-up	Status*
SHAFT FURNACE TECHNOLOGY						
MIDREX® PROCESS *(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
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	1.50	1	CDRI	'14	O
JSW Projects Ltd.	Toranagallu, Karnataka, India	1.20	1	HDRI/CDRI	'14	O
Mobarakeh Steel (Kharazi A & B)	Esfahan, Iran	3.0	2	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	1.70	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
Ardakan Steel	Ardakan (Yazd), Iran	0.80	1	CDRI	'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	1.80	1	CDRI	'18	O
Tosyali Algeria	Oran, Algeria	2.50	1	HDRI/CDRI	'18	C
Qaenat	South Khorasan, Iran	0.80	1	CDRI	'18	C
Chador Malu	Ardakan (Yazd), Iran	1.55	1	HDRI	'18	C
Algerian Qatari Steel	Bellara, Algeria	2.50	1	HDRI/CDRI	'18	C
Sirjan Iranian Co. 2	Kerman, Iran	0.90	1	CDRI	'18	C
Makran	Chabahar, Sistan-Baluchestan, Iran	1.60	1	HBI	'19	C
Cleveland-Cliffs	Toledo, Ohio, USA	1.60	1	HBI	'20	C
		86.74	93			
HYL/ENERGIRON PROCESS						
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
Khouzestan Steel (ASCO)	Ahwaz, Iran	1.03	3	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
Emirates Steel I (GHC)	Abu Dhabi, UAE	2.00	1	HDRI	'09	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 5/15/18 Source: Midrex Technologies, Inc.

Plant	Location	Capacity (Mt/y)	Modules	Product	Start-up	Status*
SHAFT FURNACE TECHNOLOGY						
HYL/ENERGIRON PROCESS *(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	'17	C
		23.43	27			
FLUIDIZED BED TECHNOLOGY						
FINMET PROCESS						
BriqOri	Matanzas, Venezuela	2.20	4	HBI	'00	O
CIRCORED PROCESS						
Arcelor Mittal Trinidad	Point Lisas, Trinidad & Tobago	0.50	1	HBI	'99	I
FIOR PROCESS						
Operaciones RDI	Matanzas, Venezuela	0.40	1	HBI	'76	I
ROTARY KILN TECHNOLOGY						
SL/RN PROCESS						
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 PROCESS						
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 PROCESS						
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
CODIR PROCESS						
Dunswart	Benoni, South Africa	0.15	1	CDRI	'73	O
Sunflag	Bhandara, India	0.15	1	CDRI	'89	O

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

World Direct Reduction Plants

Status as of 5/15/18 Source: Midrex Technologies, Inc.

Plant	Location	Capacity (Mt/y)	Modules	Product	Start-up	Status*
ROTARY KILN TECHNOLOGY						
SHENWU RHF PROCESS						
Tianjin Rockcheck	Tianjin, China	0.50	1	CDRI	'14	I
TISCO PROCESS						
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 PROCESS						
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 PROCESS						
OSIL	Keonjhar, Orissa, India	0.10	1	CDRI	'83	O
Lloyd's Metals & Eng.	Ghugus, India	0.27		CDRI	'95	O
DAV PROCESS						
Davsteel	Cullinan, South Africa	0.04	1	CDRI	'85	O
BGRIMM PROCESS						
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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2017 WORLD DIRECT REDUCTION STATISTICS is compiled by Midrex Technologies, Inc., Charlotte, North Carolina, USA. The publication is posted annually on the Midrex web site.

Midrex Technologies, Inc. compiles world DRI production data on an annual basis as a service to 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 an international process engineering and technology company that provides global process technology solutions to various industries and is principally known for the MIDREX® Direct Reduction Process that converts iron ore into a high-purity DRI or HBI for use in steelmaking, ironmaking, and foundry applications. Midrex continues to develop new technologies relating to its traditional iron and steel roots.

The following organizations supplied or assisted in collecting data for this issue of 2017 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

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

World Steel Dynamics (WSD) has audited Midrex's collection and preparation process of the "2017 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 2017.

Audited by
WSD WORLD STEEL DYNAMICS®
Englewood Cliffs, New Jersey, U.S.A.
May, 2018