DIRECT FROM MIDREX

2nd Quarter 2000

IN THIS ISSUE

Ironmaking Technology for the New Millennium

Plant Operation and Product Quality at COMSIGUA HBI Plant
MISSION STATEMENT

Midrex Direct Reduction Corporation will lead in the ironmaking technology industry by supplying superior quality services that provide good value for our clients. We will meet or exceed performance expectations, execute projects on time, enhance existing product lines, and develop or acquire new technologies. Our employees are the key to our success, and we are committed to encouraging them to grow professionally and personally.

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All tons referred to are metric tons (t) or million metric tons (Mt)

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H2 DIRECT FROM MIDREX 2ND QUARTER 2000
Introduction
During the 30-plus years since its introduction, the MIDREX® Direct Reduction Process has incorporated numerous technical enhancements such as larger capacity shaft furnaces, in-situ gas reforming, increased heat recovery, improved catalysts, and hot briquetting. This article traces the MIDREX Process through six development phases or cases: Case 1 is the original operating practice using 100 percent oxide pellets; Case 2 incorporates lump ore in the feed mix; Case 3 adds oxide pellet coating; Case 4 includes oxygen injection into the shaft furnace; Case 5 introduces the OXY+™ System, a MIDREX Technology for augmenting the reforming of natural gas with oxygen and utilizing the sensible heat; and Case 6 marries oxygen injection and OXY+ for optimum process efficiency. The paper also discusses the MIDREX HOTLINK™ System for direct hot charging of DRI to the EAF, as well as addresses environmental aspects of traditional and alternative iron-making processes.

Shaft Furnace Productivity
The single most important factor contributing to the success of the MIDREX Process has been a continual ramp up of shaft furnace productivity. Historically, the major challenge has been to improve the rate and degree to which CO and H₂ are consumed in the shaft furnace, which exerts a strong influence on productivity and energy efficiency.

Over the last 30 years, utilization of these gases in MIDREX™ Shaft Furnaces has increased by more than 25 percent. This has been achieved by improving the uniformity of solid/gas contact and by increasing the temperature of the reducing gas entering the shaft furnace.

Lump Ore Practice (1980s)
Lump ores were first used in the MIDREX Process during the mid-1970s, and the practice was widely adopted in the 1980s. This provided the additional benefit of preventing the sintering of the shaft furnace burden, as reducing gas temperatures were increased from 780°C to 850°C during this period. It also added about 13 percent to shaft furnace productivity.

Iron Oxide Coating Practice (1990s)
Development work during the 1980s led to the introduction of in-plant coating of iron oxide feed materials with CaO or CaO/MgO by the mid-1990s. As interest in this technique grew, many of the international pellet suppliers adopted the practice of pre-coating oxide pellets. MIDREX™ Plant operators were now able to increase reducing gas temperatures to slightly more than 900°C. This practice improved productivity by an additional 11 percent. Figure 3 shows the changes in general arrangement.

Between Cases 1 and 3, the temperature of the reducing gas was increased by almost 140°C, while the temperature of the shaft furnace burden was increased by only 45°C. Most importantly, these improvements were accomplished with no major capital investment or major modifications to the equipment in the typical MIDREX Plant.
Oxygen Injection (Late 1990s)

Until recently, the quality of the reducing gas was held nearly constant, while the temperature of the reducing gas at the shaft furnace was allowed to increase. However, the latest development efforts have increased reducing gas temperatures at the cost of reducing gas quality. The results have shown a clear production advantage for the higher reducing gas temperature versus the loss in reducing gas quality resulting from oxygen combustion. The introduction of oxygen injection (combustion of a portion of the reducing gas CO and H₂ by O₂) achieved this effect with great success.

Oxygen injection, shown in Figure 4, involves the introduction of high purity oxygen into the flow of the hot reducing gas stream. This practice has produced reducing gas temperatures in excess of 1000°C and burden temperature increases of up to 70°C when it is compared to non-oxygen conditions. The investment costs for a typical oxygen injection system, assuming that oxygen will be available from an across-the-fence supply, are primarily the oxygen supply piping and the flow control and safety equipment. The only operating cost increase is due to the consumption of oxygen at a typical rate of 12 to 20 Nm³/t. The reward is up to a 12 percent increase in shaft furnace productivity, as compared to the previous case.

OXY+ (2000)

OXY+ generates a reducing gas by reacting oxygen and natural gas at about a 0.5 stoichiometric ratio. The burner is designed for installation directly in the reducing gas duct after the reformer, as shown in Figure 5. Unlike oxygen injection systems, OXY+ closely controls the combustion mixing of the oxygen and natural gas to maintain consistent gas quality and temperature. This serves to minimize the temperature increase of the gas entering the shaft furnace and provides for additional opportunity to increase production.

The application of OXY+ results in a potential increase of 21 percent in shaft furnace capacity over Case 3 conditions. Midrex is currently installing the first commercial application of the OXY+ system, which is expected to be operational by the 3rd quarter of 2000.

The addition of in-situ partial oxidation of natural gas, to generate additional CO and H₂, as well as sensible heat, offers new possibilities for production augmentation in existing plants and capital savings in new facilities.

Combination Practice with Oxygen Injection and OXY+ (Future)

The optimum productivity is achieved by
maximizing the reducing temperature of the burden and the quality of the reducing gas entering the shaft furnace. These two factors are the keys to optimizing the production of any shaft furnace and its related gas generating equipment.

By utilizing a combination of the two operating practices, oxygen injection and OXY+, as shown in Figure 6, as well as by maintaining the natural gas in the reducing gas stream, it is possible to independently control the shaft furnace burden temperature and the reducing gas temperature. This permits the plant operator to maximize the performance of the shaft furnace by maximizing the utilization of the reducing gases within the furnace. This practice offers the potential for a production increase of approximately 5 percent over Case 5 conditions.

**Summary of Shaft Furnace Productivity Improvements**

Given that the single most important factor in the technical and economic success of an ironmaking process is productivity, the enhancements to the MIDREX Process since 1969 have been largely focused on that goal. Much of the productivity gains have been made by achieving higher reducing gas temperatures via lump ore use, iron oxide coating, and use of oxygen.

**Hot DRI Charging – HOTLINK**

Optimization of DR/EAF production and energy efficiency have taken a new step with the close coupling of a MIDREX Shaft Furnace and an EAF to achieve increased productivity and energy savings in the production of high quality steel. The concept places a MIDREX™ Hot Discharge Furnace just outside and above the wall of the meltpshop. This provides the opportunity to discharge directly from the shaft furnace to a hot DRI surge bin and then from the surge bin directly to the EAF by gravity.

This type of arrangement has been used in all MIDREX HBI plants to transfer hot DRI to the briquetting machines in excess of 700°C. HOTLINK Modules are equipped to handle any upset problem and are capable of discharging at full production through a DRI cooler located next to the hot DRI surge bin. The primary goal of the HOTLINK System is to supply hot DRI to the EAF as the primary discharge method from the DR plant, but to be capable of switching to cold DRI mode and back to the hot DRI mode with no delay in operation.

Midrex expects HOTLINK to produce DRI with 93-95 percent metallization and up to 4 percent carbon. The temperature of hot DRI delivered to the EAF will average 700°C. This will result in an electrical energy savings of 120-140 kWh/t of liquid steel, when 95 percent of the metallic charge material is hot DRI. HOTLINK is currently the basis of two detailed feasibility studies and Midrex expects it to be included in one of the next new plant contracts.

**The Midrex Process – A “Green” Alternative**

The continual technical development of the MIDREX Process not only has enhanced direct reduction economics, it also has provided an environmental benefit due to the more efficient use of gas and electricity. Using DRI or HBI to supplement or replace blast furnace hot metal also can have positive environmental effects.

In the United States, many sinter plants and coke ovens will be closed in the future to reduce emissions of carbon dioxide and pollutants. Total US coke consumption has averaged 23.6 million tons during the last five years, while production was just 17.6 million tons, as shown in Figure 7. The six million-ton shortfall has been met largely by imports from China and Japan. China is closing a number of small coke ovens as part of its iron and steel industry restructuring effort. Though there is a plan to replace these small facilities with larger, new ones, the changeover may not be orderly. Once Chinese coke exports decrease, the impact will be felt not only in the US but also throughout the world.

Traditional integrated mills will continue to spend large amounts for maintenance of old sinter plants and coke ovens because new installations are unlikely due to tightening environmental controls and the significant capital requirements. The use of HBI as a metallic charge is an excellent option for steel-
makers to help manage this situation. In the US, HBI has been used in many blast furnaces to continuously boost hot metal production or to temporarily increase output while relining a blast furnace or repairing a coke oven.

HBI can be used in blast furnaces to reduce coke consumption and total carbon dioxide emissions. Also, DRI and HBI can be used in basic oxygen furnaces to supplement scrap. Japanese and Korean integrated producers have started using HBI in their blast furnaces and BOFs for these reasons.

Figure 8 shows greenhouse gas emissions for various ironmaking and steelmaking processes including blast furnace/basic oxygen furnace, pig iron/EAF, coal-based DRI/EAF, natural gas-based DRI/EAF, and scrap/EAF. The figures show total carbon emissions in the form of carbon dioxide per ton of liquid steel. The calculations take into account excess energy that is converted into electricity. Note that the figures assume use of 100 percent pig iron or DRI in the EAF. Because this is not usually the case and scrap is used along with virgin iron, emissions in those cases will usually be lower than shown in the graph.

The blast furnace is a very efficient ironmaking unit and it will remain the predominant method for the foreseeable future. However, due to the need to ameliorate the environmental problems of sinter plants and coke ovens, the blast furnace will become more of a melting furnace in the future.

As Figure 8 shows, scrap-based steelmaking has much lower carbon dioxide emissions than integrated steelmaking. Also, the use of recycled scrap steel makes efficient use of an otherwise unwanted waste product. However, it is not generally feasible to use 100 percent scrap to produce high quality steels. Charging a form of alternative iron to the EAF allows the best of both worlds: the environmental benefits of scrap along with the quality benefits of the use of virgin iron. Production of DRI or HBI via a gas-based or coal-based process such as the MIDREX Direct Reduction Process or the FAST-MET® Process provides for lower carbon dioxide emissions than production of iron by the blast furnace/BOF route.

**Conclusion**

Continued development over the 30-plus years since its introduction has kept the MIDREX Direct Reduction Process on the leading edge of alternative ironmaking technology. With the addition of enhancements such as high lump ore use, iron oxide coating, oxygen injection, and OXY+, the productivity of a MIDREX Shaft Furnace can be increased up to 50 percent versus the original practices in the early 1970s. The MIDREX HOTLINK System provides a simple, reliable way to charge hot DRI directly from the shaft furnace to the EAF, resulting in higher melt shop productivity and lower production cost. Given the importance of environmental considerations today, the use of DRI or HBI produced in MIDREX Direct Reduction Plants allows integrated steelmakers to reduce coke consumption and increase hot metal output.

*This article was adapted from a paper originally presented at the SEAISI 2000 Australia Conference held in Perth, Western Australia, May 15-17, 2000.*
By Masaharu Kohno, Kota Hanao
COMSIGUA, Matanzas, Venezuela

**Introduction**

COMSIGUA, C.A. was established in May 1996, and the Plant Supply Contract was signed in June 1996 between COMSIGUA and Kobe Steel Ltd. (Japan), to build a merchant MEGAMOD™ (one million ton/year production) hot briquetted iron (HBI) plant.

Construction of the plant was completed in July 1998 (25 months after signing the contract), and the commissioning work started in August 1998. Commercial production of HBI started in the middle of September and the first commercial shipment of HBI was made on October 22, 1998.

In October 1999, after 13 months of operation, an annual shutdown was performed in order to carry out repairs and cleaning work. After that, the plant has been running stably and has produced 1,570,000 tons and sold 1,350,000 tons as of the end of April 2000.

The plant was constructed by Kobe Steel Ltd. on a full turnkey basis. The construction period lasted from June 20, 1996 to July 23, 1998 (25 months), which is one of the shortest times on record in building such type of plant.

The purposes of the establishment of COMSIGUA are as follows:

1) Developing a project in Venezuela which has a strong competitive advantage in HBI business:
   - Availability and cost-competitiveness of input materials (iron oxide, natural gas, electric power, and water).
   - Geographical advantages (close to the United States and access to ocean shipping).
2) Proactive investment to take advantage of growing market demand for the virgin iron unit.
3) Contributing to the industrial development by adding substantial values to raw materials, and providing new employment opportunities.
4) Securing foreign currency inflow into Venezuela by exporting non-petrochemical products.

**Outline of the Plant**

**Oxide Material**

The oxide material to feed the shaft furnace is constituted basically of 80% pellets produced by Ferrominera Pellet Plant, a pelletizing plant adjacent to COMSIGUA, and 20% lump ore, extracted from the San

<table>
<thead>
<tr>
<th></th>
<th>Pellet</th>
<th>Lump Ore</th>
</tr>
</thead>
<tbody>
<tr>
<td>T Fe</td>
<td>68.00</td>
<td>65.20</td>
</tr>
<tr>
<td>SiO₂</td>
<td>1.20</td>
<td>0.60</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>0.65</td>
<td>0.92</td>
</tr>
<tr>
<td>CaO</td>
<td>0.35</td>
<td>0.01</td>
</tr>
<tr>
<td>MgO</td>
<td>0.20</td>
<td>-</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.002</td>
<td>0.012</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.050</td>
<td>0.070</td>
</tr>
<tr>
<td>L.O.I.</td>
<td>-</td>
<td>5.00</td>
</tr>
</tbody>
</table>

*Table 1* Pellet and lump ore analysis (%)
Isidro iron mines of Ferrominera Orinoco, located approximately 120 km southwest of Puerto Ordaz. The typical analysis is shown in Table I.

### Plant Features

The process is the conventional MIDREX* Process. However, many technological innovations were introduced to the plant based on lots of operational experience from existing and commercially operating MIDREX™ Plants.

The oxide material is transported and loaded into three bins, one for lump ore and the other two for pellets. The capacity is 1,800 tons each, and the lump bin is equipped with a special “ladder” to prevent fines generation due to falling height. The basic blending ratio of oxide is 20% lump ore and 80% pellet. Constant feeders equipped underneath these bins control the blending ratio. Then the mixture is fed to the shaft furnace through oxide screens, where oversized oxide (+ 45 mm) and oxide fines (- 6 mm) are removed.

The shaft furnace is standard Midrex design with several innovations:

1) Adoption of thin wall refractory at the reduction zone of the shaft furnace reduces the pressure drop of the burden and also increases furnace (reduction zone) volume.

2) Adoption of a double bustle port for reducing gas injection allows the gas to better penetrate into the center of the burden in the reduction zone and thus to improve metallization of the burden in the center of shaft furnace.

3) Modification of the shape of the flow-aid insert equalizes burden descending speed between the center and wall side of the shaft furnace reduction zone.

The reformer is a conventional MIDREX™ Reformer system equipped with 480 reformer tubes (10-inch inner diameter), where the rib-ring type catalyst is used to reduce the pressure drop across the tubes.

As for the heat recovery system, there are three types of feed gas bundles; i.e., feed gas dryer bundle, cold preheater bundle, and hot feed gas bundle. The feed gas dryer bundle preheats feed gas to only 150°C in order to evaporate the mist contained in the feed gas so that the dust contained in feed gas does not stick to the inside of the

---

**Table II: Typical plant operations parameters**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Low production</th>
<th>High production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxide blending ratio</td>
<td>Pellets/Lumps %</td>
<td>80/20</td>
</tr>
<tr>
<td>Hourly production</td>
<td>t/h</td>
<td>approx. 120</td>
</tr>
<tr>
<td>Process gas flow</td>
<td>Nm³/h</td>
<td>135,000</td>
</tr>
<tr>
<td>Process gas CO₂</td>
<td>%</td>
<td>19.5 – 20.0</td>
</tr>
<tr>
<td>Reformer box temp.</td>
<td>°C</td>
<td>1,130</td>
</tr>
<tr>
<td>Reformed gas temp.</td>
<td>°C</td>
<td>930</td>
</tr>
<tr>
<td>Reformed gas CH₄</td>
<td>%</td>
<td>0.9</td>
</tr>
<tr>
<td>Reformed gas CO₂</td>
<td>%</td>
<td>2.7</td>
</tr>
<tr>
<td>Bustle gas temp.</td>
<td>°C</td>
<td>800</td>
</tr>
<tr>
<td>Bustle CH₄</td>
<td>%</td>
<td>3.5</td>
</tr>
<tr>
<td>Reduction zone P</td>
<td>Bar</td>
<td>0.80 – 0.85</td>
</tr>
</tbody>
</table>
tubes. Thereafter, feed gas is fed to the cold preheater bundle and then to ZnO catalyst to eliminate H₂S from the feed gas. Because the lump ore used has a high sulfur release to the top gas and higher H₂S concentration in the natural gas, the mixed feed gas inhibits reforming reactions by H₂S poisoning of reforming catalyst. Feed gas exiting the ZnO catalyst is fed to the hot preheater bundle to increase gas temperature and enhance the productivity of the reformer.

The highly metallized DRI is discharged from the shaft furnace and fed hot to four briquetting machines, where the DRI is compacted and briquetted. Then, the HBI is dropped into the quench tanks, where it is cooled.

Since the COMSIGUA Plant does not have any on-site loading facilities, the HBI produced has to be transported to a loading site at the shipping port by means of rail. However, to avoid HBI fines generation, all HBI transported to the

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fe</td>
<td>91.2% min.</td>
<td>92 – 93%</td>
</tr>
<tr>
<td>Metallic Fe</td>
<td>84.7% min.</td>
<td>85 – 87%</td>
</tr>
<tr>
<td>Carbon</td>
<td>1.2% min.</td>
<td>1.3 – 1.8%</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.03% max.</td>
<td>0.002 – 0.006%</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.09% max.</td>
<td>0.06 – 0.075%</td>
</tr>
<tr>
<td>Total gangue</td>
<td>6.0% max</td>
<td>3.5 – 4.5%</td>
</tr>
<tr>
<td>Drop test results</td>
<td>–</td>
<td>76 – 82%</td>
</tr>
<tr>
<td>[+38.1 mm]</td>
<td>–</td>
<td>1.1 – 1.9%</td>
</tr>
<tr>
<td>Drop test results</td>
<td>–</td>
<td>2.0% max</td>
</tr>
<tr>
<td>[4 mm]</td>
<td>–</td>
<td>0.3 – 0.6%</td>
</tr>
<tr>
<td>Product fines (-1/4&quot;)*</td>
<td>5.0 g/cm³ min.</td>
<td>5.0 – 5.3 g/cm³</td>
</tr>
</tbody>
</table>

* After shipping screen

Table III  Product specifications

Figure 3  Monthly production (tons)

Figure 4  Operational availability and plant availability
shipping port, located 13 km east of the plant, is first screened through the product screens at COMSIGUA’s plant site.

The facilities at the shipping port are rather simple (see Figure 2). The transferred HBI is discharged and stored in a product yard. Based on the shipping plan, the HBI is loaded onto the ships through a shipping screen in the shipping port to remove HBI fines. In addition, a special “soft loading” device is attached to the ship loader to avoid fines generation while loading HBI onto the vessels. Product samples are taken just after screening in order to analyze the quality of the product.

**Current Plant Operation Condition**

As the market situation began to recover in April 1999, the production rate was brought to full capacity.

Monthly production condition is shown in Figure 3, and plant availability is shown in Figure 4, respectively.

Since the annual shutdown was performed in October/November 1999, the rated hourly production has been raised and maintained at 145–150 t/h at the shaft furnace. Plant availability and operational availability have also been maintained at higher levels.

**Product Quality**

Product specifications and actual characteristics for COMSIGUA HBI are summarized in Table III.

As shown, the quality of the product is excellent and meets the HBI chemical and physical specifications.

In order to attain such high quality, several actions are being taken:

1) Close monitoring of HBI chemical quality by frequent analysis. Chemical analysis (such as metallic Fe, total Fe, metallization, carbon, sulfur) are analyzed every two hours in order to confirm the quality and to take immediate action.
2) Frequent analysis of physical characteristics, drop tests, fines measurements, and density determination are conducted to maintain the physical specifications.
3) Close observation of process parameters (temperature inside shaft furnace, process gas analysis, etc.).
4) Close observation of feeding material to shaft furnace, especially size distribution of pellets and lump ore.

The drop test is the fraction of greater than 38 mm and less than 4 mm obtained after dropping product samples from a height of 10 meters five times consecutively. Measurement of drop test is very important because these data can be used to estimate the fines generation of product during handling and transportation.

**Sales Amount of Product**

Figure 5 shows the monthly sales amount. From the end of October 1998 up to the end of April 2000, the total sales amount was 1,350,000 tons. Most of the product is exported to the USA, Mexico, France, Spain, Korea, and so on, for electric arc furnace, basic oxygen furnace, or blast furnace use.

**Summary**

After the commissioning and start-up of the COMSIGUA HBI plant in September 1998, the plant has been operating steadily and under good control of production, product quality, and other factors.

COMSIGUA had already produced 1,000,000 tons by September 1999 and 1,500,000 tons by April 2000. Now that the market is favorable, COMSIGUA has been maintaining high monthly production, more than 90,000 tons per month.

Because of the good quality of the product, many customers are becoming increasingly interested in buying COMSIGUA’s product.

**Acknowledgements**

The authors are grateful to Kobe Steel Ltd. and Midrex Direct Reduction Corporation for their excellent engineering work and assistance since the beginning of the COMSIGUA Project. During the commissioning and start-up periods, we faced many difficulties due to the lack of required skills by our operators. Nevertheless, after overcoming such problems, COMSIGUA exceeded 100,000 tons in October 1998 (120% of its nominal capacity.)

We at COMSIGUA will always appreciate the cooperation received from all the people who were in any way in touch with our project.

This article was adapted from a paper originally presented at the Iron & Steel Society’s 57th Electric Furnace Conference held in Pittsburgh, PA, Nov. 14-16, 1999.
Excellent Response to DRI Use Seminar

Responding to increased use of and interest in DRI, a seminar entitled “DRI/HBI Use in the EAF: An Idea Whose Time Has Come” was held from April 30 – May 2. The event was sponsored by Midrex, Corus Tuscaloosa, Corus Mobile, and American Iron Reduction, and held in Tuscaloosa, Alabama. It provided a forum for the exchange of technical and operating information related to the use of DRI and HBI. The by-invitation event was attended by nearly 60 steelmakers, foundrymen, MIDREX Licensees, and industry consultants. Steel mill and foundry attendees included both users and non-users of DRI.

The seminar began with a keynote speech by noted authority John Stubbles on “EAF Steelmaking: Past and Future.” Following were technical papers and roundtable discussions, with topics including: introduction to DRI/HBI handling, feeding, and melting; the impact of furnace design and DRI/HBI properties; AC versus DC operations; optimizing DRI melting; the influence of carbon levels and oxygen availability on operations; EAF optimization tools; a review of operational data; and new technologies for the 21st century. Excerpts from the presentations will be featured in upcoming issues of Direct from Midrex. The event also included a tour of the Corus Tuscaloosa mill.

Feedback from participants was overwhelmingly positive, and based on that, Midrex plans to hold the seminar annually. This event reflects Midrex’s increased focus on assisting steel mills to maximize the benefits of DRI and HBI use and thereby enhance profitability. Led by the Steelmaking/Melting unit of the Business Development Group, this effort includes educational programs, new methods to analyze EAF operations, and technology development.

First Commercial FASTMET® Plant Starts Up

The world’s first commercial-scale FASTMET® Plant has started up successfully at Nippon Steel’s Hirohata Works in Japan. The plant is designed to process 190,000 tons per year of steel mill wastes, and convert them into highly metallized DRI. The DRI product is being hot charged into Nippon Steel’s steelmaking shop along with scrap and pig iron to produce steel. Details on the facility’s operation will be published in future issues of Direct from Midrex.

The FASTMET Process shows great promise as a means to recycle steel mill wastes, with or without the addition of iron ore fines, to produce a highly metallized DRI product. Another option is FASTMELT®, in which FASTMET DRI is hot charged to an electric ironmaking furnace (EIF™) to produce blast furnace-grade hot metal that can be fed to a BOF or EAF. Midrex and Kobe Steel are promoting FASTMET and FASTMELT projects in North America, Europe and Asia.

New MIDREX® Direct Reduction Process Brochure

Reflecting a host of recent technology developments, including HOTLINK™, high carbon DRI, OXY®+, and SUPER MEGAMOD™, Midrex has produced a new brochure detailing the MIDREX Process. It includes a brief history of the process, descriptions of the new technologies, and sections on the process details, operating parameters, iron oxide requirements, product characteristics, the DRI/HBI market, and the environment. A unique feature of the brochure is the use of pertinent MIDREX™ Direct Reduction Plants to highlight each section, thus providing an informative history lesson. The brochure contains sufficient technical details to provide a good understanding of the technology, as well as allow for the calculation of approximate economics for a specific location.

The brochure is now available. If you would like a copy, please contact us by E-mail at info@midrex.com or call (704) 373-1600. The brochure will be posted on the Midrex website (www.midrex.com) in the near future.

Visit the Midrex website for up-to-date news and statistics on DRI.

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