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Commentary

“Have We Evolved?”

More than two years ago, in the 4th Quarter 2002 issue of Direct From Midrex, I wrote a commentary about the need to follow the evolutionary path forward rather than one that is revolutionary. There have been numerous examples of this during previous up-turns in the business cycle. Now that the steel industry is more than one year into its recovery with record profits and incredible raw material shortages, it is important for steel companies and the many investors wishing to now enter into the business off steelmaking to carefully evaluate investment opportunities. As the saying goes, “If it sounds too good to be true, it probably is too good to be true.”

Now that the first wave of heavy investments have been committed in the area of Direct Reduction, we can check the progress to-date. Do the new investment choices represent evolutionary steps forward or continuation of past investment patterns? We can briefly examine the new investments from the following perspectives to answer this question.

CAPACITY: During the last wave of projects from 1995–1998, the average rated capacity for a new MIDREX module was rated at just 0.9 million tonnes/year. The average rated capacity of MIDREX modules recently contracted is more than 1.40 million tonnes/year. This is an impressive +50% increase, considering the other evolutionary aspects which follow below.

MARKET: The previous cycle of MIDREX projects maintained historical patterns with investments in Venezuela, Trinidad and the Middle East. However, several break-out investments did occur in South Africa, Korea, and after a very long wait and natural gas deregulation, the USA. During this current cycle, we have a continuation of investments in the Middle East and Trinidad, but also a return to Russia and Malaysia has now been established. The largest U.S. mini-mill steel producer, Nucor, has made an investment in off-shore direct reduction by relocating a MIDREX plant to Trinidad. Previous investments in the USA are now in the process of being dismantled and relocated off-shore, and a new plant will be established in Oman for the first time as well.

PRODUCT: Perhaps tied for first place as one of the most significant evolutions is the application of the direct reduced iron product. DRI has historically been produced as a cold material, either in its natural form or in the form of briquettes (formed while hot, yet quenched and discharged cold). From 1995 – 1998, the majority (7.0 out of 8.0 million tonnes/yr.) of new capacity was cold DRI, while just 1.0 million tonnes/year was in the form of HBI. The seven MIDREX projects currently underway represent nearly 9.0 million tonnes/year of capacity. However, the true cold DRI module is now the minority (only 2.1 million tonnes/year), while hot DRI discharge has taken center stage with nearly 7.0 million tonnes/year.

DR-EAF INTEGRATION: The other most important evolution is the degree of integration between melt shop and DR plant. All MIDREX modules constructed in the mid-90s were dedicated to stockpiling the cold DRI or cold HBI prior to further handling/shipping. Each DRI module was very well insulated from downstream consumption. However, the current batch of plants underway is much more closely linked to the downstream consumers. In total, approximately 4.0 million tonnes/year will be available for hot charging to an adjacent melt shop.

As you can see from these aspects, the direct reduction market most certainly has evolved. More importantly, this evolution has taken place without requiring tremendous risks on behalf of the investor. Larger capacities have been clearly demonstrated by plants already in operation; hot discharge has long since been proven by numerous HBI plants; hot transport has also been demonstrated successfully in more than one location worldwide. Therefore, after long and careful consideration, each investor represented in the current cycle seems to have chosen the greatest evolution possible for their situation.

The first of these projects (HADDEED) was mentioned in 4th Quarter 2004 issue of Direct from Midrex and details of recently announced MIDREX projects are profiled in this issue. There will be more to follow and they will most certainly continue this trend of evolution, possibly adding some new twists and turns (both coal-based and gas-based). So keep an eye out for future issues and steelmaking evolutionary news.
Thanks to continued improved market conditions, MIDREX® Plants produced 35.0 million tons in 2004, 9.1% more than in 2003, establishing a new all-time production record. MIDREX Plants accounted for 64.1% of the 54.6 million tons of DRI produced worldwide in 2004. All the MIDREX Plants in the U.S. continued shut down throughout the year. Georgetown Steel emerged from bankruptcy in 2004 under new owners (ISG Georgetown, Inc.) but Georgetown’s MIDREX Plant was not able to restart due to a lack of iron ore availability. One new MIDREX Plant came on line during 2004 (Essar Steel’s 4th Module), and many plants established new production records (24 annual and 22 monthly production records), thanks to the greatly increased demand for metallics. Ispat Sidbec’s Module II went from half capacity to full capacity in early 2004, and Module I was restarted around the middle of the year. Some plants faced a scarcity of iron ore raw material due to the extremely high demand worldwide caused by improved prices. MIDREX Plants have produced more than 400 million tons of DRI/HBI to date.

ACINDAR
ACINDAR operated above rated capacity for the thirteenth consecutive year, with availability exceeding 8,350 hours in the year.

American Iron Reduction
AIR remained shut down throughout the year. Nucor purchased the plant for relocation.

Amsteel Mills
In their 20th anniversary year, Amsteel operated over 8,000 hours in the year, broke their previous annual production record by 5%, and set a new monthly production record in Aug 2004.

ANSDK
ANSDK continued their record-breaking streak, setting new annual production records for all three modules, with Modules II and III breaking the previous annual production record for 5.5 meter MIDREX® Shaft Furnaces. Module I set a new monthly production record, exceeding the 100,000 ton per month mark for a 5.5 m. Furnace for the first time. All three modules combined produced over 3.0 million tons of DRI in the year, and operated over 8,100 hours per year on average in 2004. In early 2005, ANSDK surpassed the 25 million tons produced from all three modules.

Caribbean Ispat, Ltd.
The company name was changed to Mittal Steel Point Lisas. Modules I and II exceeded their rated capacity with 8,150 hours of annual operation (average for the two modules). Oxygen use commenced in Module I in 2004.

COMSIGUA
Despite iron ore and natural gas shortages in Venezuela, COMSIGUA broke their previous annual production record by 5.7%, with 1.34 million tons produced, and established a new monthly production record. Being the largest HBI production in a single module, COMSIGUA reached average monthly production levels of 175-180 t/h.
These modules remained shut down for a fourth consecutive year, and have been sold to the Al-Tuwairqi group for dismantling and moving to a new location.

**Essar Steel**

Essar Steel set new yearly and monthly production records for Modules I and II, with 8,450 hours of average plant operating time. Started up Module 4 in July 2004. A significant portion of the DRI produced is charged hot to Essar Steel's EAFs.

**ISG Georgetown, Inc.**

Georgetown's MIDREX Plant remained shut down the whole year.

**Hadeed**

Hadeed exceeded rated capacity for the 20th consecutive year in Modules A and B, and for the 12th consecutive year in Module C. Module C set a new annual production record for 5.5 m MIDREX Shaft Furnaces in its first full year of using oxygen injection, surpassing their previous annual production record by 9.4%. Module C also set a new monthly production record in March.

**Mittal Steel Lazaro Cardenas (formerly IMEXSA)**

MSLC established a new annual production record for DRI produced from a single module with over 1.75 million tons produced in the year, thanks to a combination of increased productivity and excellent plant availability. Operating at an average 224 t/h, they established a new monthly production record of 165,000 tons in August. In early 2004, MSLC surpassed the 10 million ton produced mark after less than seven years of operation.

**Mittal Steel Hamburg (formerly Ispat HSW)**

MS Hamburg broke their annual production records for a third year in a row thanks to very good plant operating availability. MS Hamburg surpassed the 10 million ton mark in late 2004.

**Ispat Industries, Ltd**

On its 10th anniversary since start-up, IIL of India experienced limited production due to restricted availability of natural gas. Lump ore usage averaged 63% for the year.

**Mittal Canada, Inc. (formerly Ispat Sidbec)**

Due to the improved market conditions, Module I was restarted in July 2004 after a four year shutdown and set a new monthly production record in October. Module II ramped up production to full capacity in early 2004.

**Khuzestan Steel**

All four KS modules exceeded rated capacity with over 8,000 operating hours on average. Module IV set new annual and monthly production records in 2004.
LISCO
LISCO set a new annual production record in Module III in 2004. LISCO reached the 15 million ton mark 15 years after the start-up of its first MIDREX Module.

Mobarakeh Steel
MS set annual and monthly production records in all five modules in 2004, producing a total of almost four million tons, with an operating availability in excess of 8,170 hours on average. Reached the 30 million ton mark in 2004.

OEMK
With four modules that produced 2.1 million tons in 2004 (a 10% increase over 2003), OEMK set three new annual production records and three new monthly production records. OEMK started using oxygen in Module IV towards the end of the year for a monthly production record in December.

OPCO
Production was restrained by labor issues and limited natural gas availability.

QASCO
In their first full year of operation with oxygen injection, QASCO broke their previous annual production record for the fourth consecutive year (by 7%), mainly through increased productivity with excellent plant availability (8,455 hours in the year), while achieving high metallization (96%). QASCO also set a new monthly production record in March.

Mittal Steel South (Saldanha) Africa
In their fifth anniversary year since startup, Saldanha passed the three million ton produced mark, and averaged 64% Sishen lump usage for the year.

SIDERCA
After a plant expansion carried out in August, SIDERCA exceeded their previous monthly production record by 15% in December through increased hourly productivity.

SIDOR
In the 25th anniversary year of operation of SIDOR’s Midrex II Modules, Modules IIB and IIC set new annual production records by operating over 8,100 hours in the year, and Modules I and IIC set new monthly production records. At year end, Module I was being revamped to increase its production capacity. Production from all four modules exceeded 3.2 million tons in 2004. Through the end of 2004, Sidor’s MIDREX Modules have produced in excess of 45 million tons of DRI.

VENPRECAR
VENPRECAR’s annual production was above rated capacity but it was also negatively affected by the limited availability of natural gas and iron ore pellets in Venezuela.
The Lion Group Contracts Midrex to Build 1.54 Mty HDRI Plant

In February 2005, Lion Diversified Holdings, Berhad, Kuala Lumpur, Malaysia entered into a contract with Midrex for the construction of a 1.54 million tonnes per year MIDREX® Hot Direct Reduced Iron Plant in Malaysia.

The proposed MIDREX Plant will be located at Lion’s Banting, Selangor, Malaysia Site and will produce Hot Direct Reduced Iron (HDRI) for on-site consumption via Hot Transport at Lion’s three Electric Arc Furnaces at the adjacent MEGASTEEL and Amsteel II steel mills. The Plant will also be capable of producing hot briquetted iron in addition to HDRI.

In August of last year, Midrex announced the signing of an MOU with Lion Group to begin engineering of the MIDREX MEGAMOD® Hot DRI facility. As a result of this contract signing, start-up of the new MEGAMOD is now scheduled for 4th quarter 2006.

“This contract represents the continuation of a long-standing relationship between Midrex and The Lion Group, which began when they acquired the Amsteel HBI Plant in Labuan, Malaysia in 1992,” according to Jim McClaskey, President of Midrex who attended the signing ceremony in January.
Midrex and its parent company Kobe Steel Limited, Japan signed a contract in early 2005 with Qatar Steel Co. (QASCO) for a 1.5 million metric ton MIDREX® Direct Reduction Plant to be located in Mesaieed, Qatar.

The signing ceremony was held February 28th in Doha, Qatar. Plans call for the $267.4 million, full turnkey project to be completed within 30 months. The new plant will boost production capacity of direct reduced iron (DRI) from 780,000 metric tons to 2.3 million metric tons per year.

In May 2004, QASCO selected Kobe Steel Limited to supply the new MIDREX MEGAMOD® Plant on a turnkey basis, and made an agreement to begin engineering.

The cold DRI produced will be used to satisfy QASCO’s current and future DRI requirements following a separate melt shop expansion, which is also expected to commence engineering soon. The HBI produced will be exported to those regional melt shops.

The new MIDREX MEGAMOD Plant will use MIDREX’s very reliable hot DRI design to discharge 1.5 mty of Hot DRI (HDRI). This HDRI is either cooled and discharged by gravity through a conventional MIDREX DRI cooler, or simultaneously through a briquetting system. Although annual projected output will be 50% cold DRI and 50% HBI, the plant will be capable to deliver up to 100% as cold DRI. Short-term HBI capacity will be sufficient to produce as much as 75%, and 50% on an annual basis.

Kobe Steel will also enhance the capability of QASCO’s material receiving/handling and utilities to support the new iron ore consumption and DRI/HBI production/storage and HBI export as part of the turnkey contract.

This order represents the 54th module that will use the MIDREX® Direct Reduction Process. Developed by Midrex Technologies, Inc., a Kobe Steel Group company, the MIDREX Process is used to produce over two-thirds of the world’s DRI.

History

Formed in 1974, QASCO originally began as a joint venture between the Qatari government, Kobe Steel, and Tokyo Boeki, Ltd.
As well as holding equity in QASCO, Kobe Steel was awarded the contract to build the steelworks. When production began in 1978, QASCO became the first integrated steelworks on the Arabian Peninsula. For over 20 years, Kobe Steel supported QASCO in the management, operation and maintenance of its steelworks. In 1997, Kobe Steel and Tokyo Boeki transferred their equity shares in QASCO back to Qatar.

The facilities at QASCO consist of a MIDREX Direct Reduction Plant, which uses the plentiful supply of natural gas in Qatar to make DRI, electric arc furnaces, continuous casters and a bar rolling mill. Current DRI production capacity has doubled and is used to make 700,000 metric tons of steel bar and 300,000 metric tons of billet. Today, QASCO has grown into one of the leading steelmakers in the Middle East.

With a sharp rise in oil prices and increasing demand for natural gas, public investment in the Gulf countries has been active, resulting in a shortage of steel. Crude steel production on the Arabian Peninsula rose from 4.6 million metric tons in 2001 to 5.2 million metric tons in 2003, according to statistics compiled by the International Iron and Steel Institute. Over the same period however, the apparent consumption of steel products increased from 12 million metric tons to 14.2 million metric tons.

To meet the high demand for steel, QASCO plans to boost bar rolling capacity to an estimated 1.5 million metric tons per year. As part of the expansion plan, Kobe Steel was awarded the new contract to supply a second DRI plant based on its long association with QASCO. Other suppliers will provide a new electric arc furnace, billet caster and bar mill. The total estimated investment amounts to approximately $422 million.

Worldwide, strong steel demand and a tight raw materials market have sparked interest from steelmakers for direct reduction (DR) plants, which do not need to be used in conjunction with blast furnaces. In particular, demand has recently grown for larger MIDREX Direct Reduction Modules with capacities of 1.5 million metric tons per year or more. In December 2004, HADEED (Saudi Iron & Steel Company) in Saudi Arabia ordered a 1.76-million-metric-ton-per-year DR Plant.
In March, Midrex announced the signing of a contract for the world's first hot discharge direct reduction plant to deliver Hot DRI to an adjacent melt shop using Midrex's proprietary HOTLINK® system. This is also Midrex's first DR Plant to be sited in Oman.

The plant will be constructed for SHADEED Iron & Steel, LLC (also referred to as Hamil Steel), a new Omani company and 100% subsidiary of Al-Ghaith Holdings UAE. The plant will feed Hot DRI directly into a new melt shop being designed and supplied by VAI/Fuchs of Germany. Construction of the plant will be carried out by various subcontractors under the control of Al-Ghaith's Abu Dhabi subsidiary Advance Project Development (APD).

The new MIDREX HOTLINK module will use a 5.5 meter diameter shaft furnace to produce 720,000 tonnes/year of Hot DRI at 700° Celsius. The VAI/ Fuchs melt shop is expected to consume approximately 500,000 tonnes of Hot DRI with some scrap to produce approximately 500,000 tonnes of steel billets, while the balance of Hot DRI will be hot briquetted for sale. Furthermore, the HOTLINK plant will also be equipped with a state-of-the-art oxygen injection system for enhanced productivity and/or high carbon content DRI.

The contract signing follows ceremonies held in Oman in mid-January 2005 between Al-Ghaith and Omani ministers to secure the utilities, land, and port facilities. SHADEED Iron & Steel have also secured enough land and utilities to expand further after this initial phase. Despite the current iron ore supply constraints, Shaded has obtained sufficient commitments for its future requirements. The site is strategically located in a new Industrial Complex at the Port of Sohar in Northeastern Oman.
Midrex stated that “The port of Sohar seems to be an ideal location due to its deep water channel access and utilities availability. We are very excited to be partnering with Al-Ghaith and VAI/Fuchs on this pivotal project.”

**HOTLINK® Commercial Technology**

For more than two decades the steel industry and DRI technology suppliers have sought ways to best utilize the sensible heat of freshly produced DRI – yet none have perfected the DR-EAF combination until now. Using gravity to reliably deliver high temperature DRI into an adjacent EAF is an evolutionary step forward for the technology. Other projects announced recently (Hadeed and Lion Group) also intend to make use of the energy savings and productivity enhancement of hot DRI. HOTLINK maintains 100% sealing of the DRI until reaching the roof of the EAF, and minimizes handling for optimum yield and temperature. EAFs using Hot DRI are expected to improve annual production rates by at least 20% when compared to conventional cold DRI. With discharge temperatures well above 700° Celsius, conservation of this sensible heat for melting is essential to maximizing throughput.
In December, Midrex Technologies, Inc. signed a contract with Nucor Corporation for the sale and relocation of the American Iron Reduction (AIR) MIDREX® Direct Reduction Plant in Convent, Louisiana. The contract also includes upgrading the plant’s capacity by an additional 400,000 metric tons per year.

Dismantling of AIR is underway and plans have already begun to relocate the AIR plant and expand annual capacity with operations scheduled to start in 2006.

American Iron Reduction was originally rated by Midrex as a 1.2 million ton-per-year natural gas-based MIDREX MEGAMOD®, using technology licensed by Midrex Technologies, Inc. to produce a product known as direct reduced iron. One of Midrex’s most state-of-the-art plants, AIR began operations in 1998, but shut down in 2000 due to extremely high natural-gas prices in North America. In September, Nucor exercised its option to acquire the assets of the idled AIR plant and relocate it to Trinidad.

According to Nucor, the relocation to Trinidad will benefit from competitive supply of natural gas and favorable logistics for receiving iron ore and shipping DRI to their steelmaking facilities.
Midrex News & Views

LebGOK Signs LOI with Midrex for 1.4 Mty HBI Plant
MIDREX® Process Technology Choice for Second DR Module

Midrex Technologies, Inc. has announced that Lebedinsky GOK (LGOK), Gubkin, Russia has signed a letter of intent with Midrex Technologies for the construction and engineering of a 1.4 mty MIDREX® Direct Reduction HBI Plant.

This proposed HBI plant will be LGOK’s second direction plant and the company’s first MIDREX® Direct Reduction Plant. LGOK’s first DR Plant began operation in 1999, using the HYL 3 process; the new plant will use proven MIDREX® Direct Reduction Technology with pre-engineering scheduled to begin immediately. A consortium of Midrex and VAI will execute the project with a projected start-up of fourth quarter 2006.

LGOK plans to use 100 percent LGOK pellets for feed material, taking iron ore off the market in favor of creating a more value-added iron product for export.

Lebedinsky GOK is owned by Gazmetal Limited Liability Company, a Russian holding company that also owns Oskol Electrometallurgical Works (OEMK) mini-mill.

Al-Tuwairqi Group Signs License to Relocate MIDREX Plants
Corus DR Module to Be Moved to Saudi Arabia

Midrex recently signed a licensing agreement with Saudi Arabia’s Al-Tuwairqi Group, to enable the company to operate a recently purchased MIDREX® DR Plant. The plant is one of two MIDREX DR Plants in from Mobile, Alabama (USA) purchased by Al-Tuwairqi Group from Corus Group Plc in December 2004.

The two plants each have a production capacity of 400,000 metric tons per year. One plant will be erected at Al-Tuwairqi’s bar mill in Dammam and will be known as Direct Reduction Iron Factory. The currently idled Midrex Plant is to be relocated to Dammam, Saudi Arabia and is currently being dismantled for shipment. No plans have been announced for the second module at this time.

Direct Reduction Iron Factory will have a new rated capacity of 500,000 through equipment replacement and new process engineering advancements.

Al-Tuwairqi’s steel plant produces steel bar from billets produced in their new melt shop which began operations in 2004. The new DR plant will enable the Al-Tuwairqi Group to better manage raw material costs and ensure a supply of iron units.
Thank You!

...for making the future bright for the Direct Reduction Industry.

Over the past few months these companies have contracted nine million tons of new annual capacity to be commissioned within the next few years.

**The Lion Group**
Lion Diversified Holdings, Malaysia
Hot Discharge Furnace DR Plant

**LGOK**
Lebedinsky GOK, Russia
Hot Discharge Furnace DR Plant

**HADEED**
Saudi Iron & Steel Company, Saudi Arabia
Hot Discharge Furnace DR Plant

**QASCO**
Qatar Steel Company, Qatar
Hot Discharge Furnace DR Plant

**Al-Ghaith Holdings**
SHADEED Iron & Steel LLC, Oman
HOTLINK® Plant

**Nucor**
Nu-Iron Unlimited, Trinidad
DR Plant Relocation and Expansion

**Al-Tuwairqi Group**
Direct Reduction Iron Factory, Saudi Arabia
DR Plant Relocation and Expansion

We thank you for choosing the MIDREX® Direct Reduction Process.

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**MISSION STATEMENT**
Midrex Technologies, Inc. will be a leader in design and integration of solids and gas processes. We will meet or exceed performance expectations, execute projects on time, enhance existing product lines, and provide value-added design, procurement, logistics and field services to our clients. We will develop new business opportunities that will challenge our employees and maintain the economic vitality of our company. Our employees are the key to our success, and we are committed to encouraging them to grow professionally and personally.

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Christopher M. Ravenscroft: Editor
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**Contacting Midrex**

**General E-mail:**
info@midrex.com

**Phone:** (704) 373-1600

2725 Water Ridge Parkway
Charlotte, NC  28217 USA

**General Press/Media Inquiries**

Christopher M. Ravenscroft
cravenscroft@midrex.com

**Phone:** (704) 378-3380