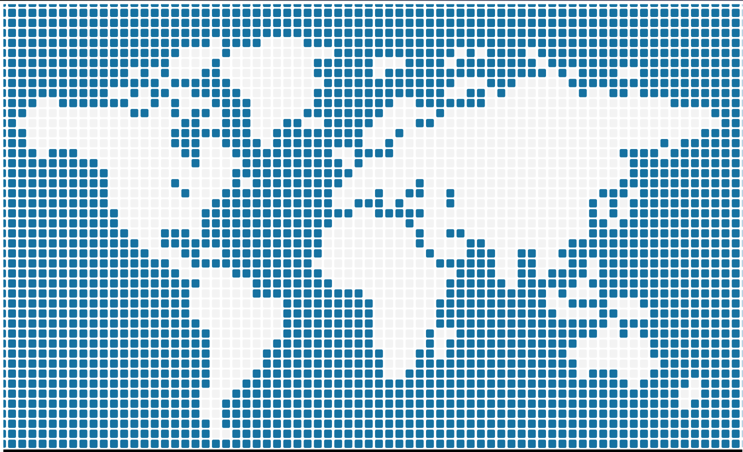

1ST QUARTER 2009

DIRECT FROM MIDREX

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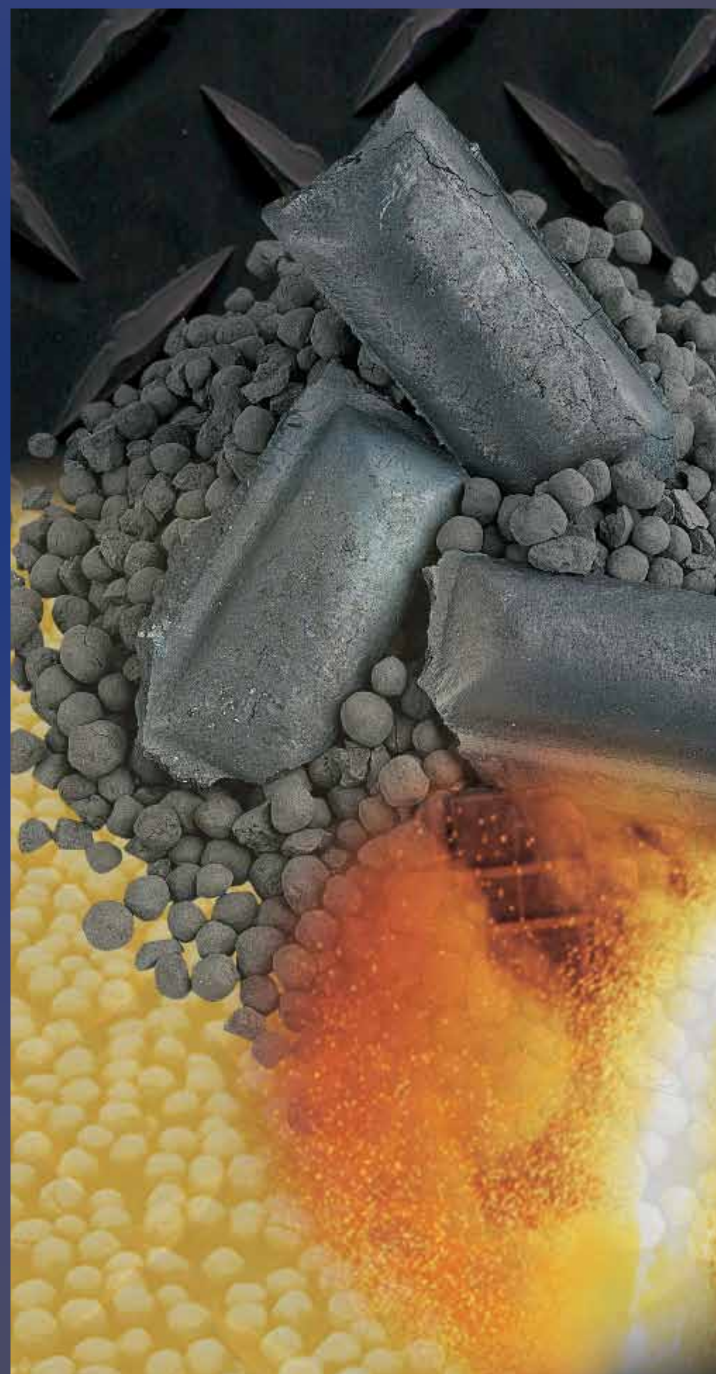


COMMENTARY

Flexibility: Nothing is permanent but change

By Stephen Montague

Since 1969, Midrex and its partners have built (or are constructing) 72 MIDREX® Modules (shaft furnaces plus reformers and associated systems) in 21 countries. These facilities have a combined annual capacity of over 53 million tons and to date have produced over 56 million tons of DRI and HBI.

What are the features of the basic process that enabled this success to occur? Three of them are especially significant: simplicity, efficiency and flexibility. These have been inherent in the MIDREX® Process since the beginning and continue to play a key role as we advance the technology.

For this commentary, I'll focus on flexibility because this is the key to long term viability considering the significant market changes over the life of a plant. MIDREX® Plants have proven flexibility regarding iron ores, reducing gas sources, module capacity, product chemistry and product use. This provides the client many options so the plant can be custom designed and operated to meet the changing demands of the marketplace. Perhaps the greatest testament to the ability of MIDREX Plants to cope with market changes is seen in module longevity. There are 18 MIDREX Modules still in operation after more than 25 years of service.

Over the years, MIDREX Plants have operated with more than 50 iron oxide sources, including pellets and lump ores, from around the world. Several plants have operated with high percentages of lump ore for extended periods of time and plants have been designed to use 70 percent lump ore continuously. This raw material flexibility is enhanced by a number of unique design features that provide for excellent gas-solids contact.

Regarding reductants, the MIDREX Process can utilize natural gas or coal syngas, with almost any ratio of hydrogen to carbon monoxide. Most MIDREX Plants use standard natural gas processed in a MIDREX® Reformer to create a syngas with a H_2/CO ratio of 1.5/1. The FMO Plant in Venezuela reforms natural gas using a steam reformer, which generates a syngas with a ratio of 3.5/1. Coal can be used to provide the reducing gas, from a COREX® Plant, coal gasifier or coke oven. A MIDREX Plant has been operating at ArcelorMittal in South Africa since 1999, using COREX Offgas with a H_2/CO ratio of 0.5/1.

Midrex can supply modules with capacity ranging from 300,000 to over 2 million tons per year (Mtpy). The MIDREX MEGAMOD® is designed for capacities of 1-2 Mtpy and the SUPER MEGAMOD® is available for production rates in excess of 2 Mtpy.

With steelmakers' continuing drive for enhanced productivity and profitability, flexibility in DRI use is a key factor. Midrex now offers an array of plants with the ability to produce multiple product streams simultaneously: Qatar Steel 2 produces cold DRI and HBI, Hadeed E produces cold DRI and hot DRI (HDRI) conveyed to an adjacent meltshop, and Lion produces HBI and HDRI transported by vessel to an adjacent meltshop. Hot charging provides major benefits in energy consumption and productivity and most clients with adjacent meltshops are specifying hot discharge/transport/charging systems. These newest plants have even more flexibility to cope with changes in the marketplace by adjusting the product for current conditions.

Stephen Montague
Vice President – Commercial & Technology

> "With steelmakers' continuing drive for enhanced productivity and profitability, flexibility in DRI use is a key factor."

As the Greek philosopher Heraclitus said, "Nothing is permanent but change," so rest assured that we will continue enhancing the flexibility of the MIDREX Process through our research and technology development efforts to meet the future needs of the steel industry.

MIDREX® Direct Reduction Plants
2008 OPERATIONS SUMMARY

Despite markedly deteriorating market conditions at the end of the year, MIDREX® Plants produced 39.85 million tons in 2008, approximately 0.7% more than in 2007. Many plants established new production records (nine annual and 11 monthly production records), due to the strong demand for metallics through September 2008. The plants in general were successfully able to satisfy the continued pressure for maximum production. Eight plants came within 5% of their record production values despite market conditions that deteriorated abruptly in October. Two new MIDREX® Modules started up in 2008: Lion DRI Sdn Bhd in July, and Khouzestan Steel's Module V in October. ArcelorMittal Canada's Module 1 restarted in December 2008 while Module 2 shut down in October 2008. Fifteen MIDREX Modules operated in excess of 8,000 hours, notwithstanding the economic downturn. Iron ore prices increased again in 2008 due to the high demand worldwide that lasted the first three quarters of the year, while Venezuelan DR plants faced shortages of locally produced pellets during this same period. MIDREX Plants have produced over 560 million tons of DRI/HBI to date.

Acindar
In its 30th year of existence since start-up in August 1978, Acindar operated above rated capacity for the 17th consecutive year and was headed for a record annual production when the crisis hit.

Antara Steel Mills
With oxygen injection and 100% oxide pellet feed, Antara operated above annual rated capacity despite the pronounced market collapse for HBI at the end of the year.

ArcelorMittal Canada
In spite of high raw material costs, Module 2 ramped up production to full capacity in April and exceeded annual rated capacity but was shut down towards the end of the year. Module I was restarted in December.

ArcelorMittal Hamburg
AM Hamburg's MIDREX Plant operated well over rated capacity in 2008 for the seventh consecutive year, almost reaching record levels of production in the 2nd quarter of 2008.

Acindar

Antara Steel Mills

ArcelorMittal Lazaro Cardenas

ArcelorMittal Lazaro Cardenas
AMLC continued operating at high capacity most of the year with high plant availability, producing 1.68 million tons in the year (just 0.08 million tons short of their record), even with a planned shut down for maintenance.

ArcelorMittal Point Lisas

In early 2008, AMPL's three Midrex DR Plants surpassed the milestone of 30 million tons produced.

ArcelorMittal South Africa (Saldanha Works)

Saldanha's COREX Export Gas-based DR Plant took an extended shutdown at the beginning of the year for relining of both the COREX and the MIDREX Shaft Furnaces. The plant averaged 63% Sishen lump ore usage for the year.

COMSIGUA

In its 10th year since start-up, COMSIGUA operated well below annual rated capacity of one million tons due to a shortage of locally produced pellets in the first part of the year and difficulties to sell HBI product in the latter part of the year. Lump ore usage averaged 50% for the year.

Delta Steel

The two Delta Steel modules did not operate in 2008.

EZDK

Hadeed

DRIC

DRIC's two modules located in Dammam, Saudi Arabia, established annual production records in their first full year of operation but operated below capacity due to lack of available oxide feed.

Essar Steel

Essar Steel Modules I, II and III each surpassed the 10 million ton mark in 2008, while modules III and V set new monthly production records. A significant portion of the DRI produced (over 60%) was charged hot to Essar Steel's EAFs.

EZDK

EZDK's Module II surpassed the 10 million ton mark while Modules II and III achieved over 8,150 hours of operation for the year. All three modules comfortably exceeded rated capacity.

Ferrominera Orinoco

Ferrominera Orinoco's HBI facility in Puerto Ordaz, Venezuela was restrained by oxide pellet availability.

Hadeed

In the 25th anniversary year of its Module B, Hadeed exceeded rated capacity for the 24th consecutive year in Modules A and B, and for the 16th consecutive year in Module C. Module C fell just 30,000 tons short of setting a new annual production record while operating over 8,600 hours. Hadeed's Module E, with a newly designed 7.15 meter diameter Shaft Furnace and a capacity to produce 1.76 million tons per year, completed its first full year of operation, setting a new annual production record. The module broke its monthly production record five times, achieving a monthly production of 165,000 tons in September (reaching 230 tons per hour), 65% of it in the form of hot DRI delivered to the steel shop. Towards the end of the first quarter of 2009 Hadeed produced its 50 millionth ton from its four MIDREX® Plants. Average carbon content in the product for the year from all four modules ranged from 2.5 to 3.0%.

Ispat Industries, Ltd

IIL of India exceeded rated capacity while operating 8,300 hours in the year, but again experienced restricted production due to limited availability of natural gas. Lump ore usage reached 100% towards the end of the year, and averaged 63% for the year with the balance being blast furnace grade pellets.

Khouzestan Steel

Khouzestan Steel started up the fifth module in October. All four existing modules exceeded rated capacity again in 2008 for the sixth consecutive year.

Lebedinsky GOK

Lebedinsky GOK's second DR module, capable of producing 1.4 million tons of HBI, completed its first full year of operation in 2008.

Lion DRI

The Lion DRI plant, located in Banting, Malaysia, started production in June 2008. The plant is designed to produce 1.54 million tons per year, ranging from 100% hot DRI to 65% HBI, with a 6.65 meter diameter Shaft Furnace. In 2008 the production of HDRI was just over 50% of the tons produced, with the balance being HBI.

LISCO

LISCO set a new monthly production record in Module 1 for the second consecutive year and were within 5% of the annual production record set for Module 1 in 2007.

Mobarakeh Steel

Module F, in its second full year of production, established a new annual record and broke its previous monthly production record twice in the year. These monthly and yearly totals exceeded those of all of Mobarakeh's other modules. Module E's production for the year was within 3.3% of its existing record value. Mobarakeh Steel produced a total of over 5.0 million tons from its six modules with an operating availability in excess of 8,140 hours on average for all modules.

Nu-Iron

In its second full year of operation, Nucor Corporation's MIDREX Plant in Trinidad broke its monthly production record twice, reaching production rates of over 210 tons per hour before the world economic slowdown began.

OEMK

Twenty five years after the start-up of Module I, with its four modules operating on average over 8,300 hours, OEMK produced over 2.4 million tons in 2008, and surpassed 40 million tons produced from all four modules. Module II set a new annual production record exceeding its previous record by over 28% after the introduction of oxygen injection in October 2007. The other three modules operated within 5% of their annual production records. Module III started using oxygen injection in September 2008. Modules II and III have produced over 10 million tons since their start-up in late 1985 and early 1987, respectively.

Qatar Steel

In its first full year of operation, Qatar Steel's dual product (CDRI and HBI) Module 2 set an annual production record and broke their previous monthly production record twice in 2008.

Sidor

Total production from Sidor's MIDREX Modules was 3.3 million tons in 2008. Module IIA established a new monthly production record in July.

TenarisSiderca

TenarisSiderca's production for the year was just 2.5% below their production record set in 2006. The plant operated 8,278 hours in the year.

VENPRECAR

VENPRECAR's production was significantly restricted by the limited availability of iron ore pellets in Venezuela. Their lump ore usage averaged 48% for the year.

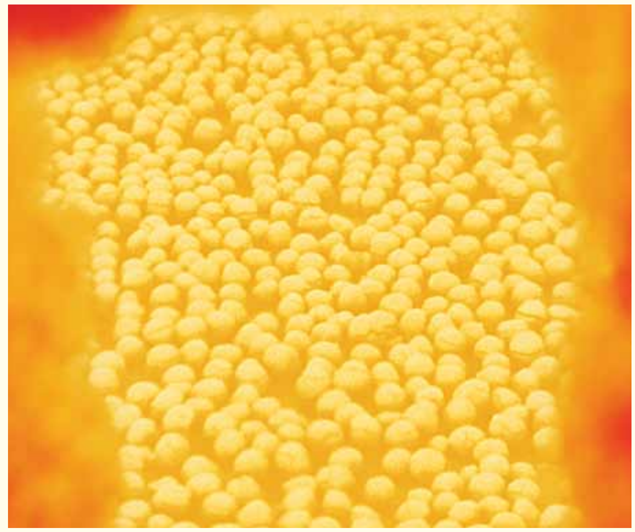
Lion DRI

OEMK

Hot Transport Conveying of DRI for Energy and Productivity Benefits

By Frank Reddemann,
Aumund Fördertechnik GmbH

John Kopfle,
Midrex Technologies, Inc.



INTRODUCTION

The world steel industry experienced remarkable growth from 2001 through the third quarter of 2008, with production and price levels reaching all-time highs. Although Chinese steel demand played a major role, economic growth in the rest of the world also contributed. DRI demand and production have grown almost continuously since 1970, to 68.5 million tons in 2008. The vast majority of DRI is used in electric arc furnaces (EAFs) and the rise in demand has been due to strong growth in EAF production, the movement of mini-mills into low residual products and metallics supply limitations. DRI production via the MIDREX® Process has risen because of the favorable economics in areas with low cost natural gas, the reliability of the process and continual technology improvements. Because of the surge in DRI demand and prices since 2004, there are now eight new MIDREX® Plants, three relocations, and one expansion recently started up or under construction, with a combined annual capacity of over 15 million tons (Mt).

Because of a necessary correction in commodity prices and a severe world financial crisis, the steel industry is in a major downturn. Nevertheless, over the medium to long term, Midrex forecasts indicate good trend growth in world steel and reduced iron production because of the growth of EAF steelmaking and the lack of sufficient scrap.

It is noteworthy that all of the new MIDREX Plants have a hot discharge feature installed or as a future option. Five of these plants have some form of hot transport of DRI to the meltshop, either HOTLINK®, an Aumund hot material transport conveyor or hot transport vessels. There are two main benefits of hot charging DRI to the EAF: lower electricity consumption and increased productivity. The energy savings occur because less energy is required in the EAF to heat the DRI to melting temperature. In addition to a lower energy requirement, it also takes less time, thus shortening the overall melting cycle. This allows higher production through a given size EAF. More details on hot transfer can be found in the article "Heating up the Bottom Line" in the 3rd quarter 2007 issue of Direct from Midrex.

For the hot material transport conveyor option, Midrex has partnered with Aumund Fördertechnik and with Siemens VAI Metals Technology. Aumund's expertise has become valuable in recent years to develop unique material handling solutions for metallurgical plants and other industries. Siemens VAI is a long-time collaborator with Midrex in supplying MIDREX® Plants.

TABLE I *Aumund Hot Transport Systems At MIDREX Plants*

Plant	Location	Start-up	Capacity (tph)	Temp. (°C)	Length (m)	Material
Hadeed	Saudi Arabia	2007	250	750	95	DRI pellets/lump
Megasteel	Malaysia	2008	3 X 400	850	10.5	HBI
ESISCO	Egypt	2010	400	800	36	DRI pellets/lump

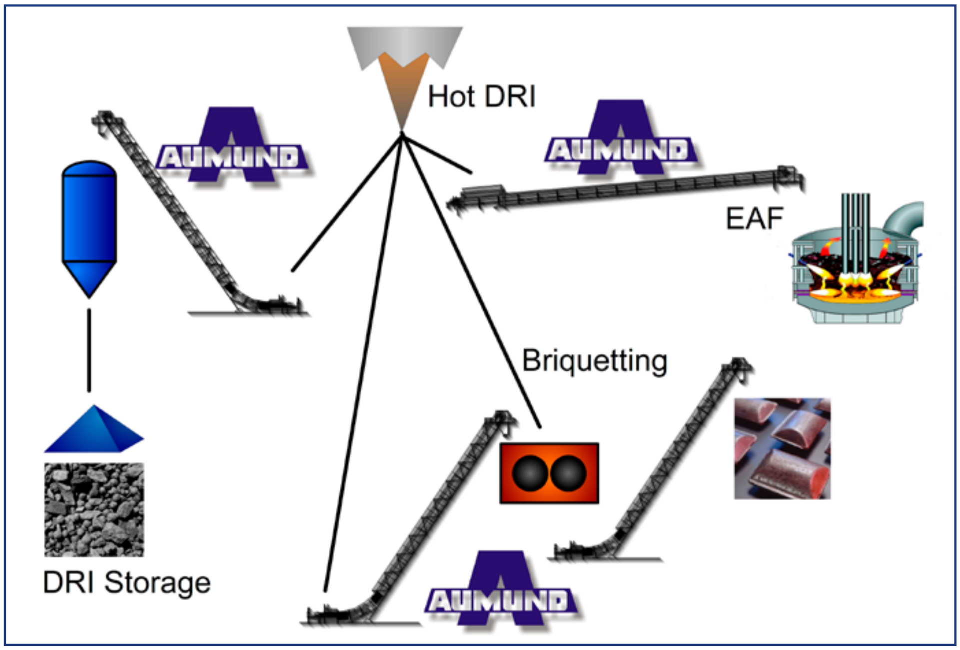


FIGURE 1 *DRI Conveying Solutions from Aumund*

FIGURE 2 *Aumund Bucket Conveyor System*

THE CHALLENGES OF HOT TRANSPORT

Over the last 10 years, Aumund has supplied approximately 1,500 conveying systems for various applications worldwide. In addition to DRI and HBI, these systems are used to transport materials such as sinter, coal and aluminum clinker at temperatures up to 1,000° C. Aumund provided a hot transport conveyor for a Siemens VAI-supplied ironmaking plant; the success of that installation led Midrex and Siemens VAI to select Aumund to supply conveyors for hot transport of DRI. With the success of the direct reduction technology, Aumund began to develop conveyors for hot DRI/HBI approximately 10 years ago. This includes systems for transport of hot DRI from the DR stage to the further processing stage, the transport of HBI before and after the briquetting process, and the continuous feeding of material into the EAF with hot DRI. These are illustrated in Figure 1 and Table I shows systems installed at MIDREX Plants.

The difficulty in hot DRI transport is not just that the material is hot, but also that it must be kept in a non-oxidizing atmosphere. There are several options for transport of hot DRI, including gravimetric (HOTLINK), large bucket, pneumatic and conveyor, each of which has its best application, depending on such factors as transport distance, component arrangement and conveying capacity. The Aumund system employs specially formed pans that have a similar form to buckets (see Figure 2). Equipped with a complete closed hood, which contains an inerting system, these conveyors provide reliable operation at reasonable costs.

Pneumatic transport systems are well suited to the transport of small quantities of materials, but have limitations due to the high energy and maintenance costs and the complicated procedures required for starting and stopping. Figure 3 compares the electricity requirements for the Aumund approach with a pneumatic system.

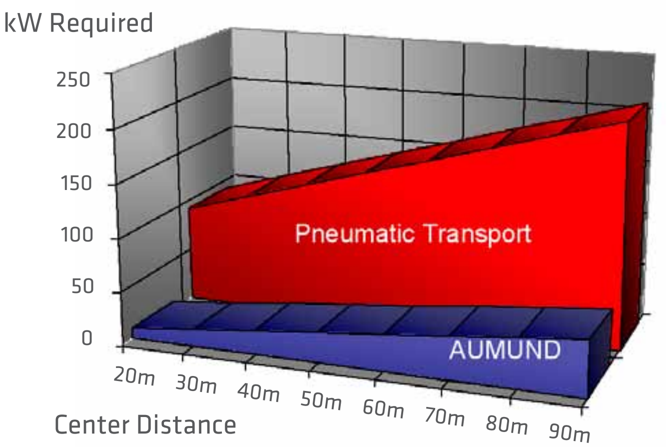


FIGURE 3 *Energy consumption for Pneumatic Transport vs Aumund System (based on 200 tph)*

The advantage of pneumatic transport – the ease with which an air seal can be realized due to the closed design – is also offered by open systems such as a mechanical conveyor.

HOT TRANSPORT CONVEYOR DESIGN FEATURES

Aumund has spent considerable time and effort in developing hot transport systems over the last 10 years. This research and development work made use of Aumund's unique expertise in designing and building material handling systems.

The conveying capacity and geometry of the hot transport conveyor system are directly related. The following basic relationship applies: the greater the height to be lifted, the smaller the conveying capacity. For reasons of space the conveyor is usually as steep as possible, but steep slopes do have an adverse impact on the ratio of dead load to live load. Along horizontal sections, a capacity of 1,200 tons per hour (tph) represents no problem, but when vertical lift is required, the capacity drops proportionally.

Currently, systems are designed with an inclination up to 60 degrees, and operating examples include lifting heights of 110 meters (m) and the conveying of 400 tph to a height of 85 m. The lift limit is dictated by the chain strength since the total installation is essentially attached to these chains. It is impossible simply to enlarge the chain links, because such a measure would increase the dead weight. For physical reasons only one (single) or two (double) chains can be used, and the capacity of the installation cannot be raised by using three or more chains. Hence, there is a physical limit to the system capacity and lift.

Over the past few years Aumund has developed chains which offer a strength (specific breaking strength of each single chain) of 3,000 kN minimum, the strongest in the world. This requires special know-how, particularly with material temperatures of up to 1,000° C. A multitude of issues have to be considered, including materials employed, lubricants, drives, mechanical components and safety devices.

The air seal through the inert gas shrouding system has been constantly improved in recent years such that dust can be contained inside the system and the oxygen in air kept outside. A completely closed conveying system was developed by using special covering, sealing and the Aumund inerting system. No dust is emitted from the conveyor and no spillage is generated underneath. At related connecting flanges the dust can be collected with the usual exhaust air system. The precise amount of inert gas can only be determined during running operations and for safety reasons we recommend an excess of gas on first start-up.

Some construction details vary depending on the specifics of the project and standard modular solutions based on Aumund experience are available. When nitrogen is not available for inerting, other gases such as offgases can be used, provided they do not contain oxygen or carbon monoxide. Special sensors monitor the safe operation and indicate the oxygen content inside the system. The offgas temperature, within certain limits, correlates to the material temperature.

For operation of the Aumund system, no specialized staff and no special equipment is required.

FIGURE 4 *MIDREX Plant at Hadeed, Saudi Arabia Including Hot Transport Conveyor System*

HOT DRI AND EAF STEELMAKING

The investment costs of the hot material transport conveyor system are relatively low compared with pneumatic transport and for some users payback times of less than one year have been reported. An additional benefit is that there is little DRI or HBI damage and minimum fines production.

Figure 4 shows the latest example of the Aumund system, the steelmaking complex at Hadeed in Saudi Arabia. It includes a MIDREX Plant with a capacity of 1.76 Mtpy and a 150 ton AC EAF that is designed to produce 1.4 Mtpy of steel for use in the petroleum, pipe and house-hold appliance industries. The facility, built by Siemens VAI and Midrex, started up in the 3rd quarter of 2007. Aumund supplied the hot DRI transport conveyor that uses nitrogen sealing. The center-to-center distance is 95 m with a lift of 48 m, which corresponds to an inclination of approximately 33 degrees. The design speed is 0.3 m/s maximum, as installed, and uses a frequency controlled drive. Hadeed has achieved outstanding results with the use of up to 100 percent hot DRI in the EAF, with typical electricity consumption of 400 kWh/t and power on time of 40 minutes. From May 15-October 28, 2008, the MIDREX Plant produced 873,000 t of DRI, all of which was fed to the EAF. The hot transport conveyor system reliability and performance were a crucial part of this success.

CONCLUSIONS

The use of direct reduction, such as the MIDREX Process, to provide raw materials for steelmaking is expected to increase, particularly in areas of the world rich in natural gas and coal. The benefits to steelmakers in using hot DRI will create further demand for transport systems which deliver the DRI directly to the EAF for hot charging. When planning future installations, it will become more important in the initial design phase to pay attention to material transport in and between the different process stages. Once certain fixed points in a design have been defined there is no longer a free choice of the conveying system, as distance and configuration of the components are crucial elements when choosing applicable transport technology. Aumund has developed and installed a range of hot material transport systems specifically for hot DRI transport. The latest has been successfully demonstrated at Hadeed in Saudi Arabia. Midrex, Aumund and Siemens VAI are confident many more systems will be installed in coming years as steelmakers realize the benefits of the hot conveyor approach.

MIDREX News & Views

DRI Production Increases Slightly in 2008

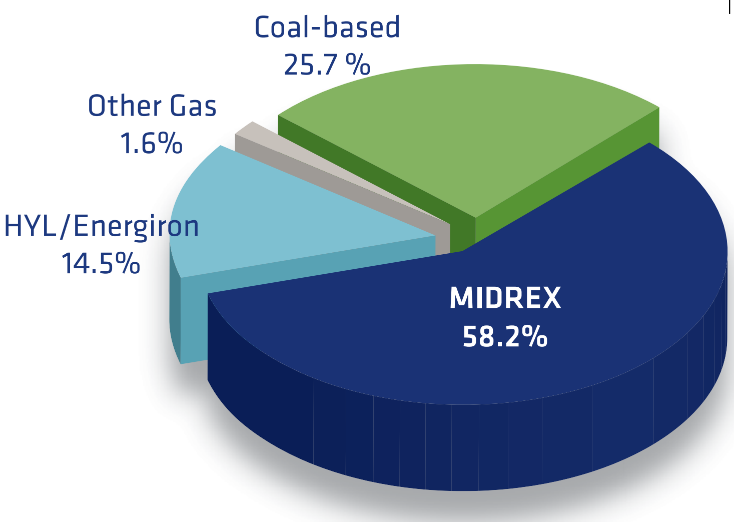
Despite harsh economic conditions in the second half of 2008, world DRI production rose from to 68.5 million metric tons in 2008. The overall total production of DRI 2008 slightly exceeded the previous maximum of 67.2 million tons by about 2%. Growth was due in part to the ramping up to production of plants that started during 2007.

Total production by all MIDREX® Direct Reduction Process plants was more than 39.8 million tons, making the technology the world's leading technology for the 30th straight year. Second was the total of all coal-based processes was 17.6 million tons, the HYL/ plants made 9.9 million tons and the other gas-based plant produced 1.1 million tons. Once again, India led all nations, making 21.2 million tons.

2008: A REMARKABLE YEAR

For the first half of the year, the entire world iron and steel industry was running at absolutely maximum capacity; prices were at previously unmatched levels and profitability was the highest it had been in many decades. Then, the world financial crisis struck.

Prices plummeted, profits disappeared and production slowed in many parts of the world to approximately half of prior rates. Only China and parts of South Asia managed to remain out of recession.



The direct reduction industry was hit as hard as other sectors. Nonetheless, in that the downturn only occurred in the final months of the year and in that production earlier in the year was at record levels, the overall total production of DRI in 2008 slightly exceeded the previous maximum, by about 2%. The total for the year was 68.5 million tons, a small increase over 67.2 million tons in the previous year. Growth was due in part to the ramping up to production of plants that started during 2007.

This included four MIDREX® Plants: DRIC (Tuwairqi) in Dammam, Saudi Arabia; Module E at Hadeed in Al-Jubail, Saudi Arabia; Lebedinsky GOK II at Gubkin, Russia and Qatar Steel 2 at Mesaieed, Qatar. One HyL/Energiron Plant began operation in 2007, the revamped Vikram Ispat 2 module at Raigad, India. Additional growth was due to the start-up of two new MIDREX Plants in 2008: Khouzestan Steel V in Ahwaz, Iran and Lion DRI in Banting, Malaysia. But most of the increase in 2008 was generated by theaddition of numerous rotary kiln, coal-based modules within India.

FORCES AFFECTING THE INDUSTRY

The situation during the year vacillated from extreme to extreme, beginning with input shortages, particularly a shortage of iron oxide pellets in Venezuela and on the world market. Phenomenally high demand existed during the first half of the year. Then as the financial crisis took hold, demand levels evaporated, supplies became more than sufficient and prices of many types of raw materials declined. As a result, the construction of additional plant and equipment for manufacture of raw materials slowed or halted. One of the most remarkable price swings was experienced in the dry-bulk freight market. Within six months, from the peak of the market in early June to the bottom of the market in early December, freight rates for large capesize vessels, such as those used for delivery of iron ore, declined by 96%.

2008 Total World Production: 68.5 Mt

	2007	2008
MIDREX	59.1%	58.2%
HYL/Energiron	16.8%	14.5%
Other Gas	1.6%	1.6%
Coal-based	22.5%	25.7%

Source: Midrex Technologies, Inc.

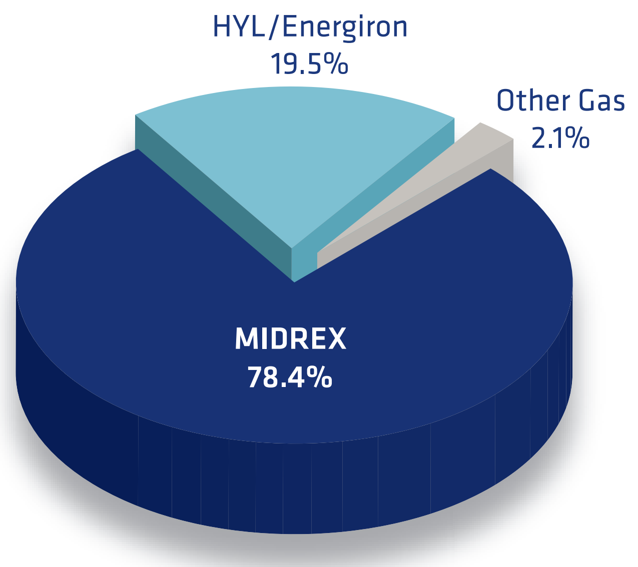
MIDREX News & Views

By the end of the year demand and prices had dropped until approximately one-third of all DR capacity was at idle, awaiting an economic rebound. Blast furnace ironmaking was similarly turned down. By December, blast furnace production, excluding China, was running at about 58% of the rate experienced six months prior.

OUTLOOK

As this was written, in April 2009, the world economy and the steel industry remained in the doldrums. Initial signs of recovery are evident, but it appears that it will be slow and prolonged.

2008 World Gas-based Production by Process



Total World Production: 50.9 Mt

	2007	2008
MIDREX	76.3%	78.4%
HYL/Energiron	21.7%	19.5%
Other Gas	2.0%	2.1%

Source: Midrex Technologies, Inc.

Christopher M. Ravenscroft: Editor

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