DIRECT FROM MIDREX

4TH QUARTER 2019

INSIDE THIS ISSUE

COMMENTARY

SLOW ROAD TO RECOVERY FOR DR-GRADE PELLETS

By Vincent Chevrier, PhD
General Manager – Business Development

The past year has been challenging for many iron and steelmakers, especially those who rely upon merchant direct reduction-grade pellets for their iron ore supply. Prices of oxide pellets, iron, and steel have varied over a broad range, putting a strain on profitability. At times, the operating expenses of some ironmakers have exceeded the sale price of their product, forcing curtailment of operation until the situation improved. While other times, the business climate was more favorable. In short, economic forces driving supply and demand caused fluctuations that were beyond the control of the steel companies.

Iron ore supply, especially high-grade pellets, have been restricted since late-2015, when a mining tailings dam collapsed in Brazil and caused the closure of over 20 million tons per year of production. Then, in January 2019, a second tailings dam failed and another 50 million tons per year of ore production was shuttered. These and other supply disruptions put iron ore prices on a seemingly never-ending escalator. Within eight months (November 2018 until July 2019), the base price for iron ore, as indicated by the price of 62% Fe sinter fines upon arrival in Northeast China, nearly doubled. Simultaneously, the premium for direct reduction-grade pellets, which already was at a remarkably high level, increased by $13/t. At its peak, in summer of 2019, the price of 67% Fe pellets, fob Brazil, was around $140/t.

Normally, when raw materials costs rise, it is possible to raise the price of the product to compensate. Sometimes, even greater profits can be made. But not this time. Worldwide steel prices slumped, as the two largest global economies engaged in a trade dispute. Prices of both long products and flat products slipped by 20-30%. Ironmaking plants, particularly those forced to buy merchant ore on the world market, were pinched between falling product prices and rising raw materials costs.

The squeeze was even tighter in the direct reduction industry. Direct reduced iron (DRI) output had surged by nearly 40% during the prior two years, and growth was expected to continue at a very rapid pace. Demand for seaborne DR-grade pellets was forecast by the International Iron Metallics Association to grow by 50% over the next five years. Then the two tailings dam failures occurred at mines that were major sources of high-grade pellets – and everything changed.

How did the DR plants deal with this problem? Primarily, by expanding their sourcing to include non-conventional ores; lump ores and lower grade pellets. However, each of these actions involved difficulties. For instance, DRI made from lower grade pellets contains higher amounts of gangue, which increases the slag volume in an EAF and reduces the yield.

The demand side of the equation is more difficult to forecast. Will economic growth return to the high rates of a few years ago and drive steel demand? No one knows. What we do know is new MIDREX® Plants are coming into production in 2019-20, increasing overall demand and consumption volumes. Although the DR-grade pellet market will be tight for several more years, we should not see the large swings like earlier this year.

Midrex recently hosted a panel of five iron ore suppliers – Anglo American, Baffinland, Bahrain Steel, Rio Tinto, and Vale – at the annual International Conference on MIDREX Technology, where we heard their views on the market, as well as industry news and updates. The storm seems to be abating – supply is gradually increasing and prices have returned to more tolerable levels. Although producers of DR-grade pellets are actively working to increase their output, no new capacity is planned in the short-term.

This issue of ***Direct From Midrex*** presents the first installment of a three-part series that focuses on the four interrelated factors that influence iron unit yield in DR/EAF steelmaking. When pellet supply is tight and prices are high, increasing metallic iron yield becomes more important. Part 1 discusses iron ore selection.

Getting the Most from Raw Materials Via the Direct Reduction/EAF Route

Maximizing Iron Unit Yield from Ore to Liquid Steel (Part 1)

This series is based on a paper titled, "Getting the Most from Raw Materials – Iron Unit Yield from Ore to Liquid Steel via the Direct Reduction/EAF Route" by Christopher Manning, PhD, Materials Processing Solutions, Inc. and Vincent Chevrier, PhD, Midrex Technologies, Inc. and articles previously published in *Direct From Midrex*.

*Beginning with this issue, **DFM** will present a three-part series on getting the most from raw materials, focusing on the four interrelated factors that influence iron unit yield via the DR/EAF route:*

- *Ore selection (Part 1)*
- *DRI physical properties (Part 2)*
- *DRI handling and storage (Part 2)*
- *Melting practice (Part 3)*

INTRODUCTION

Iron units represent the largest operating expense of a direct reduction plant, and metallic iron units represent the largest operating expense of an EAF steelmaking plant. Increasing or decreasing yield by a few percentage points can have a greater impact on total operating cost than a 50% swing in energy cost.

Yield is king when evaluating cost at the metallic iron unit stage, as well as at the liquid metal stage. However, iron unit yield from ore to liquid steel can vary over a wide range. Metallic iron unit losses can add up to greater than 15% during handling, storing, and melting of direct reduced iron (DRI).

Large costs associated with iron unit losses are sometimes hidden, as they can be distributed across several unit operations. These costs must be controlled to remain competitive in today's iron and steel market, which is why it is essential to be mindful of the factors that influence yield: ore selection, DRI physical properties, handling and storage, and melting practice.

Traditional integrated blast furnace/BOF operations have had over 100 years to develop procedures, technologies, and methods for maximizing iron unit yield by minimizing, capturing, and recycling oxide wastes at every stage of the process. In contrast, commercial steel production via the direct reduction/EAF route has been around only for less than 60 years and still has many opportunities for improvement, such as maximizing net iron unit yield from ore to liquid steel.

PART 1 – ORE SELECTION

Ore chemistry and oxide mechanical properties both influence yield through to liquid steel. An ore with the optimum chemistry may not have the optimum mechanical properties for producing DRI. The ore that leads to maximum yield likely will be a compromise of oxide pellet chemical and mechanical properties. Lump ore also can be reduced in gas-based direct reduction shaft furnaces, but the availability of suitable ores (especially ones with very high Fe content) is becoming more and more limited. However, lump ore can cause challenges in the shaft furnace and material handling system. Therefore, pelletized ore currently is the primary feedstock for shaft furnace direct reduction operations around the world.

Iron ore specifications for direct reduction use should be determined by the overall economics of the DR plant and the associated steel mill. If it becomes necessary to alter the specifications, the resulting impact on the cost of steel production must be considered.

CHEMICAL CHARACTERISTICS

Specifications for the chemical composition of iron ore feedstocks are usually dictated by the intended user of the DRI, rather than the direct reduction process, because the only major chemical change to the iron ore in the direct reduction process is the removal of oxygen – no melting nor refining. As a result, most of the impurities and gangue in the oxide feed are present in the DRI product. Therefore, the iron content of the feed materials should be as high as possible and the gangue content (especially acid gangue constituents, like silica and alumina) as low as possible. The total amount of gangue in oxide pellets and lump ores generally should not exceed 3-4%. Excessive gangue will require additional electric power in the EAF and increased refractory wear.

It should be noted that the removal of oxygen from the iron oxide pellets and lump ores will cause an apparent increase in the percentage of both the iron and the impurities, although the relative amount of each remains constant.

The following chemical constituents should be considered when selecting an iron ore for direct reduction use:

- Total iron
- Silica & alumina (acid gangue)
- Lime & magnesia (basic gangue)
- Phosphorus
- Sulfur
- Copper
- Titania

TABLE I shows the maximum practical chemical quality for oxide materials, as well as the preferred limits for producing DRI best suited for EAF steelmaking.

	Practical Limits (%)	Preferred Limits (%)
Fe	66.0 min.	67.0 min.
SiO_2 & Al_2O_3	3.5 max.	2.0 max.
CaO	2.5 max.	
MgO	1.0 max.	
P_2O_5	0.03 max.	0.015 max.
S	0.025 max.	0.015 max.
Cu	0.03 max.	0.01 max.
TiO_2	0.35 max.	0.15 max.

TABLE I. *Iron Oxide Chemical Quality Limits*

PHYSICAL CHARACTERISTICS

The physical attributes of iron ores often are more important to a direct reduction process than the chemical characteristics. A preferred DR feedstock will be of consistent size to allow homogeneous feeding, have good reducibility characteristics, and sufficient mechanical strength to prevent degradation and fines generation during handling, transport, and melting. These characteristics are determined by screen analysis, tumble test, and the measurement of compression strength.

The mechanical properties of the oxide, such as crush strength or drop strength, impact the overall yield of the DR plant, as oxide fines/dust can be generated during handling and storage. Most of the handling and storage concepts for oxides also apply for DRI.

The following physical characteristics should be considered when selecting an iron ore for direct reduction use:

- Size – About 95% of pellets should be in the size range of 9-16 mm. Lump ores should have a size range of 10-35 mm, with 85% within the range. The -3mm fraction should be minimized.
- Mechanical Strength – Tumble strength for pellets should be 90-95% +6.73 mm. For lump ores it should be 85-90% +6.73 mm. Cold compression strength for pellets should be 250 kg or greater. Tumble strength and cold compression are indications of how well the oxide pellets have been indurated. Low tumble and cold compression strengths mean higher fines generation during handling.
- Bulk Density – Low bulk density means a reduction in unit weight or capacity of a hopper or other volumetric devices, such as the reduction furnace. Pellets and lump ores should have a bulk density of at least 2.2 t/m^3.

REDUCTION CHARACTERISTICS

Reducibility can be gauged by the residence time in the reduction zone required to reach a certain degree (%) of metallization at a certain temperature. The reduction furnace in a MIDREX® Plant is sized for 4-6 hours of effective burden residence in the reduction zone. Most oxide pellets and lump ores used for direct reduction have adequate reducibility within a 4-hour range at reduction temperatures below the fusion temperature.

This means there is a direct relation between reduction temperature, reducibility, and productivity (the higher the reduction temperature, the higher the reducibility and the productivity). However, the reduction temperature is limited by the point of agglomeration (fusion temperature) inside the reduction furnace. The agglomeration tendency (percentage of pellets sticking together in clusters during reduction) can be improved by coating the pellets to control the basicity ($CaO + MgO/SiO_2 + Al_2O_3$).

If a particular pellet has a higher clustering tendency, it often can be overcome by blending in lump ore. Most lump ores act as lubricants to the furnace burden, preventing clustering due to their tendency to decrepitate.

TABLE II shows the desired physical and reduction characteristics for lump ores and oxide pellets used in direct reduction applications.

	LUMP ORES		OXIDE PELLETS	
PHYSICAL QUALITY	ACCEPTABLE	PREFERRED	ACCEPTABLE	PREFERRED
Size:				
Nominal	5x35 mm	10x25 mm	5x18 mm	6x16 mm
9x16 mm	N/A	N/A	85% min.	95% min.
- 5 mm	8% max.	5% max.	5% max.	3% max.
Tumble Strength:				
+ 5 mm	85% min.	90% min.	92 min.	95% min.
- 28 mesh	10% max.	7% max.	6% max.	4% max.
Compression Strength:				
Average	N/A	N/A	150kg min.	250kg min.
< 50 kg	N/A	N/A	5% max.	2% max.
REDUCTION CHARACTERISTICS	ACCEPTABLE	PREFERRED	ACCEPTABLE	PREFERRED
Midrex Linder Test (760° C)				
Metallization	90% min.	92% min.	91% min.	93% min.
Degradation (- 3 mm)	10% max.	5% max.	5% max.	2% max.
Hot Load Test (815° C)				
Tumble Strength (+ 3 mm)	85% min.	90% min.	90% min.	95% min.
Average Compression	N/A	N/A	50 kg min.	100kg min.
Clustering	0	0	0*	0

* Agglomeration at temperature above 760° C is acceptable if metallization at 760° C is at least 93%

TABLE II. *Iron Oxide Physical Quality & Reduction Characteristics*

In direct reduction, thermal fragmentation will occur first as the iron ore heats followed by reduction fragmentation as the ore starts to reduce from hematite to magnetite. Both occur during the first 30 minutes of reduction. Fines produced by fragmentation are mostly recoverable as metallized fines, which can be briquetted for subsequent use by the EAF steelmaker. Good quality oxide pellets generally experience very low reduction fragmentation.

Most lump ores are subject to thermal fragmentation, which occurs when heating the ore in a temperature range of 375-425° C. The rate of heating does not seem to be important. However, when the ore reaches the temperature range, some of the ore disintegrates into fragments. Lump ores with low reduction fragmentation will generate 3-4% -4 mm fines, while ores with high reduction fragmentation can yield up to 15% -4 mm fines.

OPTIMUM OXIDE PELLET COMPOSITION

A great deal of laboratory-scale research and plant-level experimentation has been conducted to determine the optimum composition of a DR-grade oxide pellet. The answer depends on specific plant conditions and the iron ore market. In the current market, DR-grade pellets are recognized as a top-tier quality pellet and command a significant price premium.

Several key factors distinguish a DR-grade pellet from a typical blast furnace-grade pellet. Generally, the Fe content of DR-grade pellets is 67% or better, whereas blast furnace-grade pellets are typically 65% Fe or lower. The high iron content is important to minimize gangue, especially acidic components like SiO_2 and Al_2O_3 in the DRI product (cold DRI, CDRI; hot DRI, HDRI; and hot briquetted iron, HBI). Because the majority of DRI is melted directly in an oxidizing steelmaking furnace, higher acid gangue will lead to a larger slag volume in the steelmaking furnace and higher iron losses to the high FeO slag. This is less of a concern for HBI when it is used in a blast furnace under highly reducing conditions. However, the higher Fe content may be needed to meet the density requirement for maritime transport.

In addition to total iron in the pellet, its reducibility also impacts the overall yield. Several factors influence the hot reduction behavior of the oxide pellet in the direct reduction shaft furnace. The specific mineralogy of the ore, as well as the fluxed basicity of the pellet (ratio of basic-to-acid components) will determine the degree of reduction that can be achieved. Lab testing often is the best way to evaluate the reducibility of a given pellet.

In addition to hot reducibility, the oxide pellet chemistry will determine the tendency of the pellet to stick and form clusters in the shaft furnace. Upset conditions in the shaft furnace can result in significant iron unit loss to non-prime product, which may or may not be suitable for recycling through the shaft furnace.

Finally, the sulfur and phosphorus content of the ore can have an indirect impact on the iron unit yield. Higher S and/or P level in the DRI may require different slag practices in the EAF to remove the contaminants. A higher basicity slag will result in a larger slag volume and thus larger FeO loss to the slag. This will be discussed in more detail in Part 3 – Melting Practice of this series of articles.

CONCLUSION

Knowing the operating characteristics of direct reduction-grade ores can prove invaluable in optimizing a plant's performance and controlling its operating costs. Iron ore purchases represent up to 2/3 of total operating cost; therefore, iron ore evaluation and selection are extremely important to the operational and financial health and longevity of a direct reduction plant.

Reduction characteristics, such as reducibility, agglomeration tendency, and degradation during reduction should be included in a raw materials specification. However, there is no internally accepted test procedures to evaluate these properties for direct reduction applications. Therefore, it is very difficult to make ore suppliers accept these properties in specifications, especially if penalties are involved.

In addition, not all iron oxide raw materials possess all of the desired chemical, physical, and reduction characteristics. Therefore, blends of different materials, especially combinations of good quality pellets and lump ores, often are used by direct reduction plants. The advantages and disadvantages of each type of oxide pellet or lump ore must be considered to determine which combination will provide the lowest operating cost while maximizing production and maintaining product quality. ■

MIDREX WATER TREATMENT MANAGEMENT

For Increasing Plant Availability & Productivity

By Fayçal Finnouche, *Service Manager – Water*, David J Oswald, *General Manager Water Services, Midrex Technologies Gulf Services FZCO*; and John Linklater, *Program Manager - Services, Midrex Technologies, Inc.*

INTRODUCTION

The emergence of DRI production technology over the last 50 years has revolutionized the steel industry by providing a more environmentally-compatible method of iron production. DRI provides electric arc furnace (EAF) operators the means to compete at the highest steel quality levels and blast furnace operators the ability to optimize their hot metal production and reduce emissions.

From humble beginnings in Portland, Oregon, USA, in 1969, where the two modules that comprised the first MIDREX® Plant were each rated at 150,000 tons per year (t/y), Midrex has been at the forefront of the direct reduction industry both technically and commercially. Today, the world's largest single module DRI plant is in operation near Oran, Algeria, at the Tosyali Algeria steelworks. This MIDREX Plant is rated at 2.5 million t/y and is capable of producing hot and cold DRI (HDRI and CDRI, respectively) to meet the requirements of the steel plant's EAF melt shop. When HDRI is sent to the melt shop, the EAF electrical and electrode consumption will be lower and tap-to-tap times will be reduced, as compared to using a 100% scrap mix. A similar MIDREX Plant soon will be commissioned at Algerian Qatari Steel in Jijel, Algeria.

In 2018, as in every previous year since 1987, plants based on MIDREX Technology produced more than 60% of the world's DRI supply, and the cumulative total of DRI production since 1969 eclipsed 1 billion tons. MIDREX Plants consistently have the industry's highest average number of annual operating hours and best average plant availability percentage.

Midrex Technologies, in collaboration with its construction partners and process licensees, has made significant strides in advancing DRI process technology and overall plant reliability. Major engineering initiatives have improved equipment performance and reliability, resulting in plants operating at near-optimal rates. Plants are able to run longer campaigns between maintenance shutdowns and major repairs. Today, plants typically operate 8-14 months between major shutdowns.

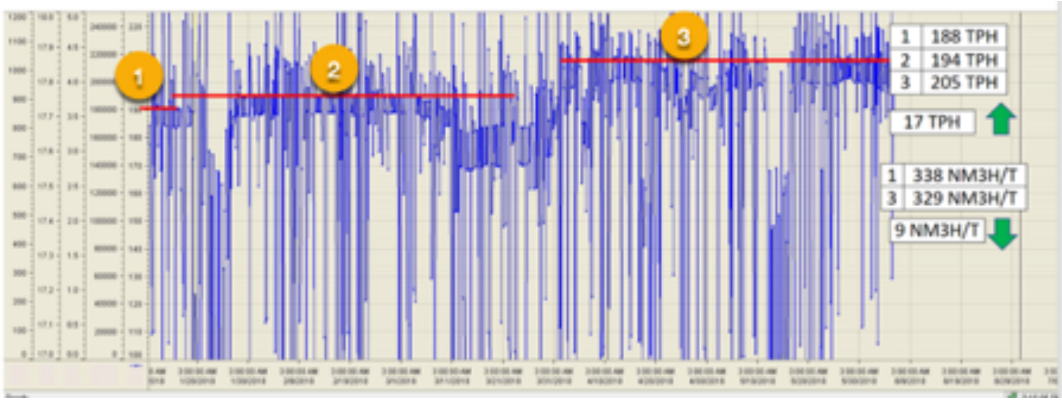


FIGURE 1. *Example of RPS data*

TECHNOLOGY AND SERVICES

Midrex has developed an Integrated Plant Solution (IPS) for water treatment management, specifically aimed at enhancing plant availability and productivity. It combines several programs that together address the following industry imperatives:

- Create additional production opportunities
- Reduce maintenance & operating costs
- Protect critical equipment & components
- Deliver quality production

IPS ties the operational decision-making with water treatment and maintenance, providing a holistic approach to solutions. A critical component of this integrated solution is Remote Professional Services (RPS). RPS allows Midrex operations experts to remotely view the plant DCS in a read-only environment. Operational data is observed from the Charlotte control room and analyzed using the extensive technical expertise of Midrex, supported by proprietary software to troubleshoot specific problems and enhance the production process. Based on the findings, Midrex will recommend solutions and operational adjustments to a plant's operations team. These suggestions, backed by actual plant data and sound technical reasoning, can be further discussed and implemented by the plant with Midrex assistance, if deemed appropriate. Utilizing this second "layer" of experience has proven to have significant, real time advantages to the plant's production and operating parameters. It also has the advantage of utilizing all of the Midrex in-house disciplines including proprietary software.

Figure 1 follows the production and natural gas enhancement at one client over a 6-month time period. During this period, plant operators and management worked with Midrex's RPS team to make incremental changes, which resulted in significant enhancements.

THE ANATOMY OF A WATER SYSTEM-RELATED SHUTDOWN

With all the advancement in DRI process technology through the years, one area that has changed little is the treatment of the water circuits. However, enhanced water treatment can have a significant impact on increasing production availability, reducing operating costs, and protecting critical component assets. So, it comes as no surprise that one of the primary tasks during a shutdown is to remediate problems associated with the water system.

In 2018, Midrex performed a survey and found that nearly 30% of "annual" outages were attributable to remediation of water-related problems, such as scale removal, sludge removal, packing removal, cleaning and replacement, and numerous other related issues ***(Figure 2)***. The amount of time and man-

FIGURE 2.
Typical problems found in DRI plant water system

power required to fix these problems are "hidden" costs to an operating plant. They are budgeted and incurred regularly, so few questions are raised about fixing the problems, as they are considered a "cost of operation."

Midrex's strategic partner, Chemtreat, initiated a study with the gas stripper at the voestalpine Texas HBI plant to determine if improvements to clarifier performance could be achieved against industry norms. The plant originally had the gas sripper installed for safety reasons (to remove CO) but the functionality of the equipment is uniquely suited for enhancing water treatment since CO_2 is also removed.

To understand the importance of CO_2 in the water, the Pourbaix Diagram is included as ***Figure 3***. Essentially there are both soluble iron (Fe_2) and insoluble iron (Fe_3) species in any given process recirculating in the water (PCW) circuit. Depending on conditions, a significant amount of iron could be in the soluble state. These conditions are defined by the Pourbaix Diagram.

The diagram shows the relationship between oxidation-reduction potential and pH. In a PCW circuit that does not have a CO_2 stripper, the pH of the water circuit is generally < 8, which favors a higher level of soluble iron (Fe_2) recirculating and being carried over the weir. With a CO_2 stripper present prior to the clarifier, the pH of the recirculating water is elevated and a significant level of soluble iron – perhaps greater than 50% – becomes insoluble and therefore, precipitates out within the clarifier.

This phenomenon has a dramatic effect on clarifier performance because more iron is capable of removal - where it is designed to be removed – within the clarifier. Without the CO_2 stripper, soluble iron leaves the clarifier and as the CO_2 naturally evolves, the iron converts to insoluble iron throughout the return water circuit, generating deposition. Specifically, the advantages of this design change include:

- Improved iron removal at the clarifier, and potential additional iron credits at the pelletizing or fines collection plant
- Reduced fouling in the hot and cold wells of the cooling tower
- Reduced tower fill fouling
- Reduced pipework fouling and packing fouling going to and into the top gas scrubber
- Reduced localized corrosion in the return loop due to reduced carbonic acid (HCO_3) formation
- Reduced erosional effects of excessive iron oxide abrasion as the water recirculates
- Reduced potential for iron induced micro-bio corrosion
- Improved blowdown water clarity and improved environmental compliance

Additionally, the removal of CO_2 reduces the potential for calcium carbonate scaling because the calcium hydroxide (lime coating source) reaction with CO_2 will not occur, as shown below:

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s)$

$Ca(OH)_2(s) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$

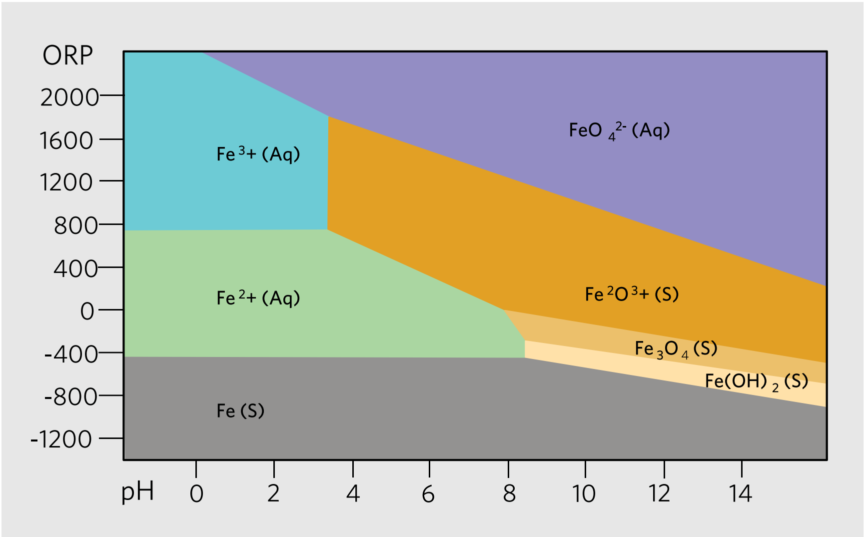


FIGURE 3. *Pourbaix diagram*

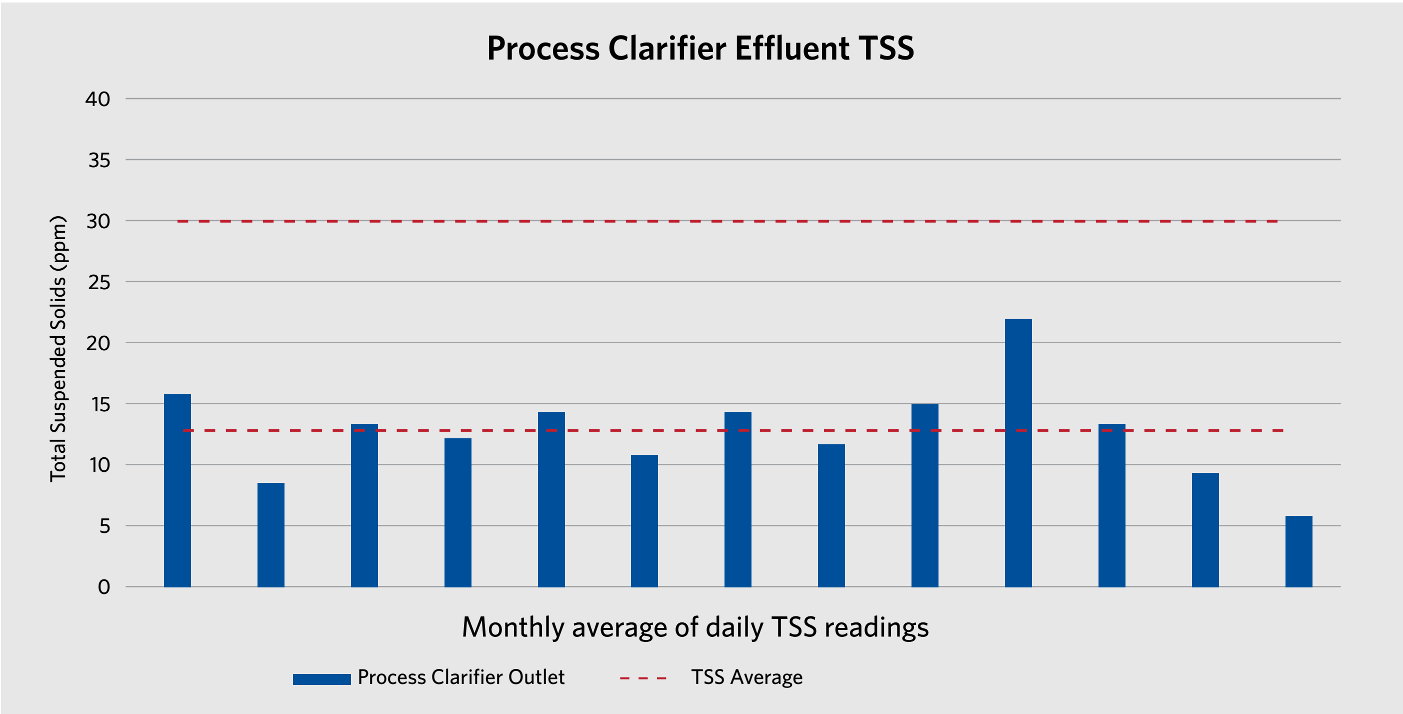


FIGURE 4. *12-month TSS average*

RESULTS-BASED SOLUTION

With the introduction of this equipment, separate "clean water" and "dirty water" systems, and the strategic placement of chemical injection points, Midrex and Chemtreat significantly altered water treatment strategies to prove how much better the system could function. During the initial campaign, total suspended solids ***(Figure 4)*** were much lower than any plant for which Midrex has data. Treatment products and dosages were altered to determine the best result.

Other key indicators (water flows and operational pressures) to key components, such as top gas scrubber, reform gas cooler, and temperatures remained stable indicating that typical fouling was not occurring.

After nearly two years of uninterrupted operation, the plant decided to have a shutdown and inspect the component and the water system. The results were exceptional. Packing and nozzles in the top gas scrubber ("dirty water" system) was free from deposition. The seal gas cooler and reformed gas cooler, supported by the "clean water" circuit, also were free of build-up ***(Figure 5, next page)***.

Findings after 22 months of continuous operation were the best results ever recorded for a water system, according to Midrex experience. Plant personnel and Midrex engineers agreed that the system could have run another 1-2 years without experiencing water quality issues.

Midrex has used these findings in discussing how to best optimize future and existing plants to realize:

- Maximum plant availability, thereby extending tph production
- Reduced maintenance costs
- Asset protection
- Quality optimization

SUMMARY

The Integrated Plant Solution (IPS) for water treatment management combines the following:

- Best-in-class water treatment strategies – selecting the right chemicals, dosed at the right location and at the right levels to achieve the needed results for the plant.
- Engineered solutions – to provide the CO_2 stripper and other associated equipment and separate water systems, if required.
- Remote Professional Services (RPS) powered by MidrexConnect™ – focused on plant optimization. This utilizes various Midrex proprietary software and experience to optimize plant operation and troubleshoot issues.

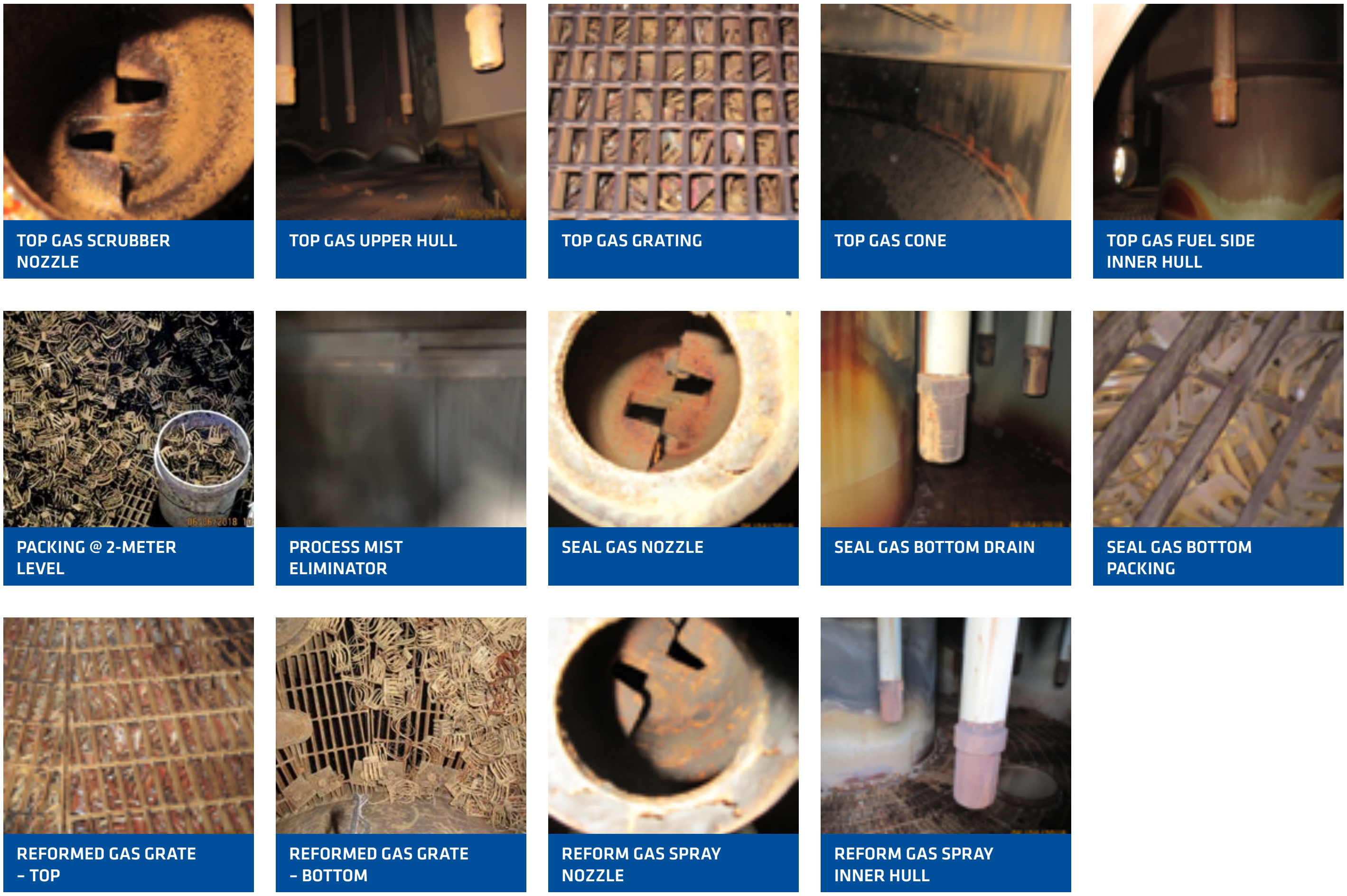


FIGURE 5. *After 22 months of continuous operation*

This is achieved by viewing real-time, read-only screens of the plant DCS in the Midrex headquarters control room. The operators can identify where process variables and water issues can impact the entire plant. Findings are communicated to the plant operations team.

- Technical field support – Midrex embeds service employees at the local plant to ensure results are achieved.

Since the development of the IPS program, Midrex engineers have been working with an earlier generation module to design, built, construct, and deploy a new CO_2 stripper to help optimize the plant. Chemical dosing equipment was upgraded and chemical feed was optimized. Treatment strategies were aligned to ensure Midrex/Client objectives are met post commissioning. The timeline for implementation was August- September 2019. Additionally, the RPS team will soon implement this service to enhance support.

Midrex's expectation is that collectively IPS will enable the DRI manufacturer to extend campaign life and optimize productivity shutdown-to-shutdown. IPS will ensure that the desired production parameters are better controlled, so day-to-day operations are not impeded by water or process-related issues. As a team, Midrex and a plant's operations personnel, can work together to significantly improve existing plant operation using the strengths of Midrex's engineering, IT resources, and water services team in a comprehensive program. ■

MIDREX News & Views

Midrex Opens Office in Dubai

Midrex Technologies Inc. has announced the opening of a new office, Midrex Technologies Gulf Services FZCO, located in the Airport Free Zone (DAFZA) in Dubai, UAE. The establishment of this office marks a significant footprint expansion for Midrex and acknowledges the importance of the Middle East and North Africa (MENA) market. Over the last decade, some of the largest and most advanced MIDREX® Plants have been commissioned in this region.

The decision to open a Dubai office brings Midrex closer to its clients and licensees. "Throughout the 50-plus years of business, we acknowledge that listening and responding to our customers' needs has benefited both the industry and Midrex," General Manager of Midrex Gulf Services, David Oswald said. "Our expectation is that faster response time and flexibility will strengthen relationships with the market and will enable Midrex to maintain its leadership role in direct reduction ironmaking (DRI) technology."

Initially, the office will primarily support the aftermarket group, Midrex Global Solutions, with a focus on water treatment and comprehensive integrated service offerings. The expectation is that additional support and services will be conducted by the Dubai office as the market expands.

Midrex Technologies Gulf Services FZCO is located at Building 5AE, Room 804 DAFZA, Dubai UAE. Midrex Technologies, Inc. is headquartered in Charlotte, NC, USA with offices in the UK, India, and China.

Cleveland-Cliffs HBI Plant On-Track for Mid-2020 Start-Up

Cleveland-Cliffs, Inc. announced completion of the 457-foot tall reactor tower for its Hot Briquetted Iron (HBI) Plant in Toledo, Ohio, USA, on September 30, 2019. The MIDREX® Shaft Furnace structure, which was completed in just 296 days, represents a significant milestone in the overall plant construction project. The reactor tower is the key critical path item in achieving the scheduled start-up of commercial production of HBI in mid-2020.

MIDREX News & Views

2019 International Conference on MIDREX® Technology

INTERNATIONAL CONFERENCE
DUBLIN • 2019 •
ON MIDREX® TECHNOLOGY

Forty-one representatives from 13 MIDREX® Plants, as well as personnel from Kobe Steel, Ltd., Primetals Technologies, Paul Wurth, and ChemTreat, gathered in Dublin, Ireland, during the third week of October. The three-day technical sessions featured a keynote presentation on the steel market from Wood Mackenzie, a panel discussion focusing on the global outlook for iron ore by major suppliers, and presentations by plant representatives and Midrex. The purpose of the annual conference is to strengthen relationships through sharing of technical information and operational experiences.

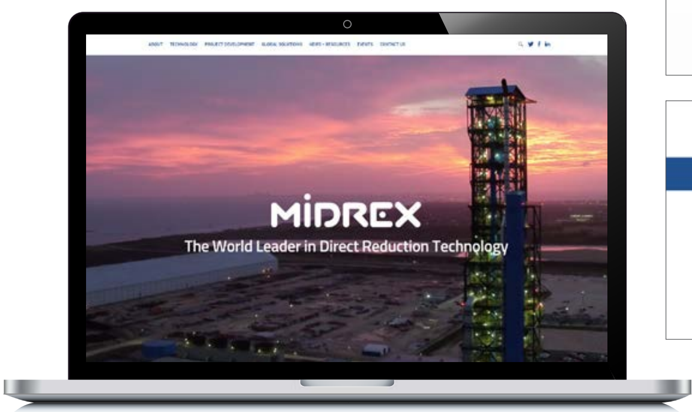
Qatar Steel was presented an award by Midrex at the conference, honoring the record-setting performance of more than 5,000 hours of continuous operation in 2019 by their DR-2 module. A celebration was also held at the Qatar Steel plant in Messaieed to recognize the plant personnel who worked to achieve the record *(see photo)*.

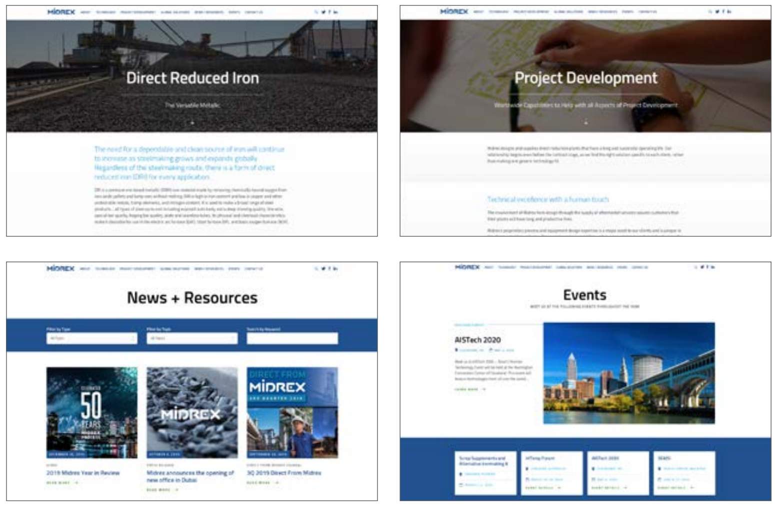
The Qatar Steel DR-1 operators also recorded a noteworthy performance by achieving 186 days (4,464 hours) of continuous operation in 2018. ■

News & Views

New look for midrex.com

We are pleased to announce the launch of the new Midrex Technologies, Inc. website.





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