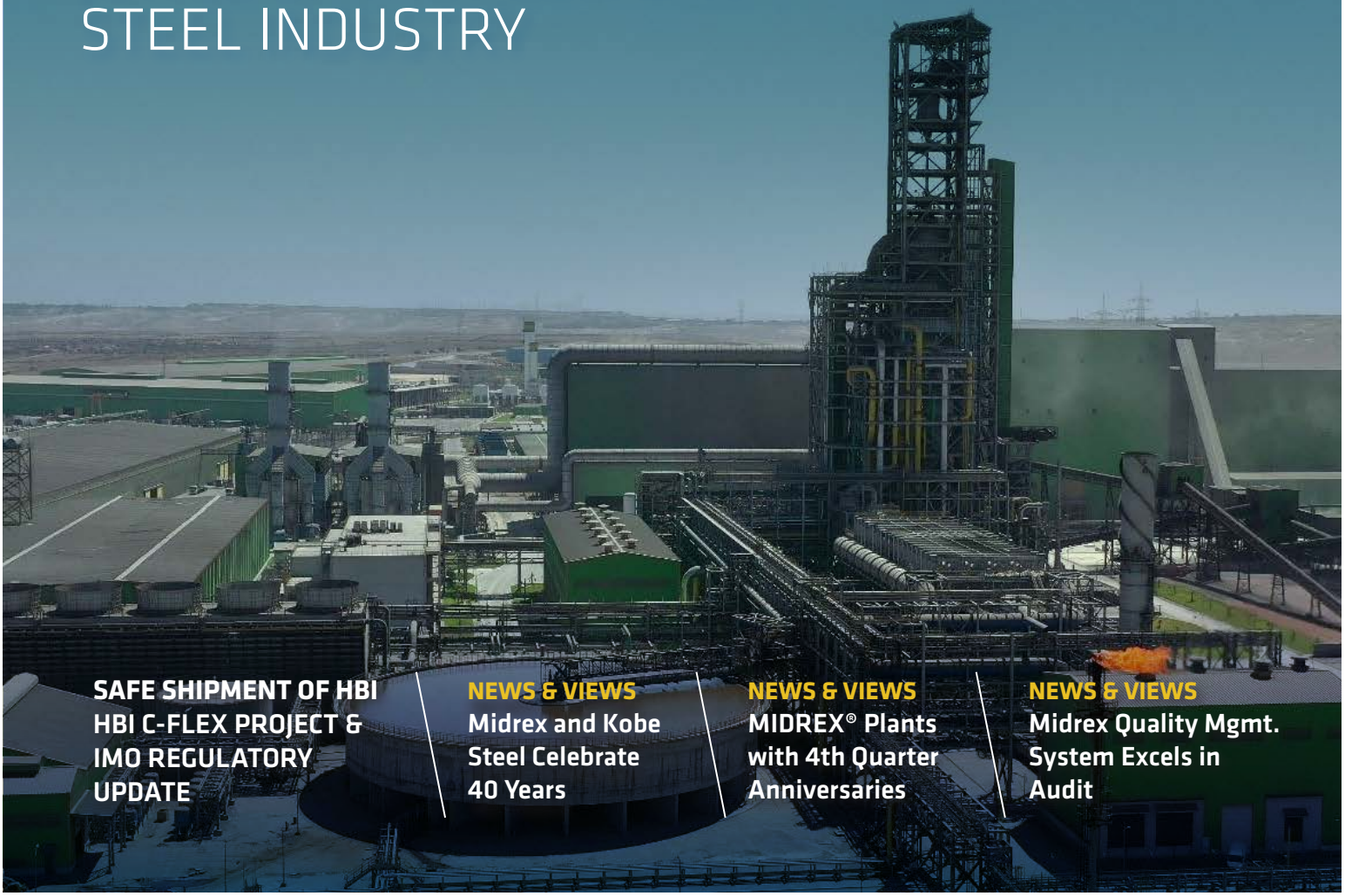
MIDREX

DIRECT FROM MIDREX

4TH QUARTER 2023

TOSYALI ALGERIE

JEWEL OF THE ALGERIAN STEEL INDUSTRY



SAFE SHIPMENT OF HBI
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COMMENTARY

THERE'S MORE TO A MIDREX PROJECT THAN MEETS THE EYE

By Scott Updike
Director of Projects
Midrex Technologies, Inc.

Midrex is world renowned for designing, supplying, providing construction advisement, and commissioning direct reduction plants along with making certain that these plants have long and successful operating lives. Together with our strategic construction partners (Kobe Steel Group, Primetals Technologies, and Paul Wurth), we support our clients from project conceptualization through transition to normal operations. Midrex involvement continues by offering ongoing support through our Technical Services and Global Solutions teams to ensure our clients can maximize the value of their investments.

A MIDREX® Direct Reduction Plant project typically involves seven distinct phases: Project Conceptualization, Planning and Contracting, Design & Development, Construction, Startup & Commissioning, Performance Testing, and finally Handover & Project Closure.

In the first phase, we work with clients to identify the basic project concept, perform a pre-feasibility study, identify and test feed material sources, provide permit level engineering information to assist our clients with obtaining the necessary permits for the facility, as well as explore and provide access to Export Credit Agency (ECA) financing solutions.

During the Planning & Contracting phase, we work hand-in-hand with clients to fully develop a detailed technical specification for the project, an execution plan/specification, and a mutually acceptable contract.

Following contract signing, we move into the Design & Development phase. The first step is to conduct a joint kickoff meeting with the execution teams of all parties to solidify the execution plan and ensure all lines of communication are established. After the kickoff, our teams immediately get to work executing the basic and detailed engineering aspects of the project. Our teams quickly integrate our activities with our strategic partner(s), as well as with client engineering partners / balance of plant (BOP) engineering firms that also participate in the project. As the Development phase continues, our teams commence ordering materials

COMMENTARY

and equipment for the project. Throughout execution, Midrex adheres to its ISO 9001 certified quality program ensuring all design documentation and vendor manufacturing programs meet our strict requirements.

The Construction phase typically starts with our client executing all civil works and underground infrastructure for the DRI plant site. These activities include leveling & grading, piling & foundations, as well as utilities feeds that may be placed underground, such as power, natural gas, hydrogen, water, and sewer necessary for the plant. During this time and under the observation of Midrex advisors, materials and equipment are shipped to site. Our advisors help ensure that materials and equipment are received, stored, and maintained in accordance with manufacturer requirements until the time they are installed.

Midrex and our partners actively collaborate with our client teams to optimize the deployment of our construction advisors based on construction progress. Our initial advisors typically arrive as materials shipments begin and about the same time as the first structural columns are placed for the shaft furnace tower. As the work progresses, we will provide subject matter expert advisors for each discipline including refractory specialists to help guide our client teams through construction process.

Operator training is another critical activity that is performed during this phase. Midrex typically provides supervisor-level and operator-level training for our clients. The supervisor training is classroom-based and the operator training is divided into a classroom phase and an onsite phase at an existing operating plant.

Approximately 3 to 4 months before reaching the end of construction (mechanical completion) for a DRI plant project, Midrex begins to mobilize our start-up & commissioning team to start Pre-Commissioning and Cold Commissioning efforts together with the client's operations team. During Pre-Commissioning, the teams verify that all items of plant equipment, systems, and services are completed and are ready for commissioning. Cold Commissioning is divided into single equipment cold commissioning, to verify the functionality of the equipment within a system, and system cold commissioning, involving multiple pieces of equipment to verify the functionality of the system. Some examples of the activities that are performed during Cold Commissioning include: powering up equipment, safety interlocks checks, stroking valves, local operation, uncoupled and coupled equipment runs, adjustment of alarms & setpoints. Typically, at the end of Cold Commissioning, the MIDREX Shaft Furnace is filled with iron oxide pellets.

Once each system completes Pre- and Cold Commissioning, the Midrex start-up & commissioning team will lead the project into Hot Commissioning, which typically starts with lighting the auxiliary burners, subsequent heat up, a controlled refractory dry out process, and conducting hot leak checks. Once this is complete, our teams will light the main burners and continue to bring the plant up to process conditions. During this time, our teams will continue to perform process and equipment interlock checks, adjustments, and overall optimization.

After completion of Hot Commissioning, the team will transition to plant start-up. Start-up begins with the addition of process natural gas into the feed

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gas, which starts the reduction process in the furnace.

Our teams will continue to operate the DRI plant to ensure stabilized operation and to achieve DRI product quality. Once a specified number of tons of quality DRI are produced, our teams will declare "First Product." This is typically the first critical milestone signifying that the DRI plant is ready for operation and is often the transition point to the next phase.

After reaching "First Product," we will typically transition directly into the Performance Testing phase of the project. During this phase, the Midrex start-up and commissioning team along with the client operations team will continue to operate the DRI plant in an optimized manner over a specified period of time to achieve or exceed predefined performance metrics for the facility. These metrics typically include production rates, carbon content in the product, metallization, and other consumption factors. Once all parameters have been achieved, our teams will sign off and declare "Plant Acceptance."

Once "Plant Acceptance" is achieved, the Midrex team will typically transition all operational decisionmaking to the client and begin the process of demobilization from the site. However, should a client have a need for continued support, Midrex Global Solutions can provide onsite operator support as well as Remote Professional Services (RPS) from our DCS control room in Charlotte, NC.

At this stage, the Midrex project team will move into the final phase of the project - Handover & Project Closure. During this phase, our teams will finalize and issue as-built drawings for the project (where applicable), close out contracts, perform lessons learned reviews, archive project documentation, and provide warranty administration throughout the warranty period for our clients.

Midrex has a storied history of executing complex DRI plant projects throughout the world with our global client base. Midrex engineers and project execution teams are among the best and most experienced in the world when it comes to DRI technology. What sets Midrex apart is our collaborative approach to project development and execution, as well as our guaranteed plant performance backed by the Midrex name.

It takes innovation, initiative, and a passion for excellence to harness the potential of direct reduction technology. And experience, expertise, and commitment to implement projects on-time and on-specification throughout the world backed by a dedicated aftermarket services team. It is how Midrex has delivered the best investment value for more than 50 years and continues to set the example for sustainable ironmaking solutions.

But it is what happens after start-up and commissioning that separates Midrex from other technology suppliers. We enter into a two-way technology licensing agreement with our clients, which brings together the collective expertise of Midrex engineering and technology development and the worldwide operating experience of the family of MIDREX Plants. This exchange of knowledge and practical know-how is what keeps MIDREX Technology fresh, vibrant, and on the leading edge.

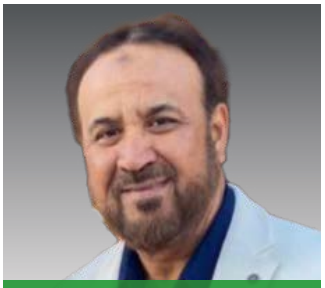
→

In this issue you can read about the initial success of a pillar of the emerging Algerian steel industry, Tosyali Algerie, and the latest developments in the International Iron Metallics Association (IIMA) project to establish a more accurate schedule for handling and shipping DRI fines. Plus, we celebrate the 40-year anniversary of Midrex becoming a member of the Kobe Steel Group, and MIDREX Plants achieving significant operational milestones in 4Q2023.

TOSYALI ALGERIE

JEWEL OF THE ALGERIAN STEEL INDUSTRY

By MOHAMMAD R SIDDIQUI
GM Iron Making



By SAIYAD SAJID
Plant Manager (Beneficiation, Pellet and DRI Plant)

INTRODUCTION

Tosyali Iron Steel Industry Algerie A.Ş. (Tosyali Algerie) is one of 10 key associate companies of Tosyali Holding Inc., primarily engaged in steel production and related industries. Tosyali entered the steel business in 1952 in Iskenderun, Turkey, as a manufacturer of hand-worked stovepipes and boiler buckets. Today, the Tosyali Group is Turkey's leading global steel manufacturer with 25 manufacturing sites including associates and joint ventures on three different continents operating under the umbrella of Tosyali. Tosyali produces 7000+ steel products broadly classified in nine categories:

- Hot Rolled Steel
- Cold Rolled Flat Steel
- Billets
- Spiral Welded Pipes
- ERW Pipe and ERW Hollow section group
- Low Carbon Steel
- Alloyed and Non-Alloyed Steel
- Wire Rod and Rebar
- Rolled Profile and Angles

Tosyali is the most rapidly growing industrial company in Turkey, with annual manufacturing activity of more than 6 million tons (Mt) while employing 10,000+ of various disciplines. Outside of Turkey, Tosyali is developing a 6 million tons/year (Mt/y) iron ore mining and beneficiation facility in Angola and will establish a 0.5 Mt/y rolling mill in Senegal in addition to the Phase 4 expansion of its integrated direct reduced iron-electric arc furnace (DRI-EAF) steel complex in Algeria, Tosyali Algerie.

DEVELOPMENT OF TOSYALI ALGERIE

Tosyali's presence in Algeria has reduced the nation's importation demand, which produces remarkable currency savings.

Tosyali Algerie's production covers 70% of Algeria's building materials needs, which are essential for economic development. Ferrous waste (i.e., scrap) from all over Algeria is used as raw material for steel production, and Tosyali Algerie has provided over 4,000 direct jobs and thousands of indirect jobs including high value-added positions and interesting career opportunities for graduates of technical universities in the region.

Tosyali Holding initiated its Algerian operations in 2013 through affiliate company Tosyali Iron Steel Industry Algerie A.Ş. (Tosyali Algerie). The Tosyali Algerie iron and steel complex is located in the industrial zone of Bethioua, 40 km east of Oran. The complex covers 4 million square meters and has easy access to the Mediterranean Sea. Phase 1 included a 1.5 Mt/y EAF steel meltshop and a 1.2 Mt/y rolling mill.

The initial production capacity of reinforcing bar (rebar) was 1.2 million tons and represented 28% of demand at this time. Like reinforcing bars, wire rods are in high demand and a vital product for development.

Phase 2, which was completed in 2015, added a 0.5 Mt/y wire rod mill, which met 60% of the total needs of Algeria at that time. Wire rods are used for the manufacture of dozens of products such as wire mesh, wire, nails, and screws.

The third phase of development started in 2018 aimed to complete the integration of iron ore into the finished product process. In this phase, Tosyali Algerie set up a 4 Mt/y iron ore beneficiation plant and 4 Mt/y pellet production unit to transforms iron ore fines into iron oxide pellets to feed the world's largest capacity direct reduction module. The combination of pelletizing plant and direct reduction module allows for greater flexibility in sourcing iron-bearing materials and relieves the need for importing costly scrap to feed the steelmaking furnaces. Third phase was successfully completed in 2018 and all production units were put in operation since then.

The DRI plant produces a combination of hot DRI (HDRI) and cold DRI (CDRI). HDRI is directly fed via a hot transport conveyor to the adjacent 2.4 Mt/y EAF melt shop, providing greater EAF productivity and energy savings. Tosyali's MIDREX® DR Plant has achieved world record DRI production for the year 2020, 2021, and 2022 for a single operating module.

Phase 4 of the Tosyali Algerie steel complex, a DRI-EAF integrated flat steel production facility, began in 2022. In July 2021, Tosyali Holding awarded Midrex and its partner Paul Wurth a contract to build a second DRI plant at the Tosyali Algerie steelworks. The new DRI plant will produce 2.5 million tons of HDRI and CDRI with the capability to operate with increased percentages of hydrogen in the future. HDRI will be fed via a hot transport conveyor to the new 2.4 Mt/y EAF melt shop, providing greater EAF productivity and energy savings. During melt shop outages, the MIDREX Plant can continue producing CDRI up to full capacity.

The project will be carried out in two phases with each phase consisting of the following units:

- 4.0 MTPA iron ore beneficiation plant
- 4.0 MTPA iron ore pelletization plant
- 2.5 MTPA direct reduction plant
- 2.2 MTPA steelmaking plant
- 2 MTPA hot strip mill
- 0.8 MTPA cold strip mill
- 0.4 MTPA galvanizing mill
- 0.2 MTPA color-coated coil mill

The hot strip mill along with all upstream units will be put into operation in 2024, while the cold rolling mill and galvanizing will come into operation in 2025.

When the fourth development phase is completed in 2024-25, Tosyali Algerie will join the ranks of flat products producers. The emergence of DRI as a high-quality source of iron and a diluent for the impurities in steel scrap has opened this high-end market to EAF-based steel mills.

Discussions have started with Midrex for the DRI-3 project, which will utilize the MIDREX Flex™ concept for hydrogen transition.

PRODUCTION UNITS

Beneficiation Unit: 4 million tons annual processing capacity

Sinter feed available in the world market is processed through highly flexible circuits of the wet beneficiation method. The process comprises of grinding, magnetic separation, thickening, and filtration to produce 4 million tons of enriched iron ore concentrate containing high ferrous content and low gangue. In the beneficiation process, the size of the iron ore concentrate is controlled by maintaining necessary parameters in primary and secondary grinding mills. Suitable moisture required for the pelletization process is controlled by adopting advanced vertical press filter.

TOSYALI DRI-2 PROJECT

Project start date:	Q4 2021
Engineering:	Completed
Civil construction:	Completed
Structural steel erection:	On-going
Mechanical equipment:	On-going
Piping erection:	On-going
Electrical installation:	On-going
Cold commissioning:	Q1 2024
First product:	Q2 2024

Pelletizing Unit: 4 million tons annual production capacity

The iron ore must be pelletized to 8-18 mm pellets to feed the direct reduction unit. Pellet manufacturing combines chemical, thermal, and mechanical processes to provide the required homogeneous composition of the pellets. The granulation is done in a humid environment in disks to ensure the cohesion of the material. The porosity of the pellets promotes chemical reactions in the direct reduction unit. Once the ore is compacted, the pellets are cooked through burners to enhance their cohesion and eliminate unwanted elements. The iron ore is now ready for direct reduction.

Direct Reduction Unit: 2.5 million tons hot and cold DRI annual production capacity

Direct reduction is a set of chemical reactions using reformed natural gas (mainly hydrogen and carbon monoxide) to transform iron ore into ferritic iron without reaching the melting temperature. The principle is to expose the iron ore to the reducing action of the gas at high temperature (about 1,000° C) to reduce it (remove oxygen).

Our partners for the realization of the direct reduction unit are Midrex Technologies, Inc. and Paul Wurth, world leaders in direct reduction technology. The processing capacity of our facility is more than 300 tons per hour thanks to a continuous production system. This unit offers us a significant advantage in terms of production flexibility and greatly reduces our dependence on purchased ferrous waste (i.e., scrap).

TOSYALI ALGERIE HDRI/CDRI

DR PLANT ACHIEVEMENTS

PRODUCTION

- World record annual DRI production for three consecutive years since 2020
- Highest daily production of 7,860 MT (327.5 TPH) achieved on 14 February 2023
- Highest weekly production of 54,795 MT (326 TPH) achieved in Feb 2023
- Highest monthly production of 227,739 MT (316 TPH) achieved in November 2022
- Highest daily HDRI production of 7,586 MT (316 TPH) achieved on 30 November 2022

OPERATING HOURS

- 1000+ hours of continuous operation achieved eight times
- 2000+ hours of continuous operation achieved three times (2,910 hours without any interruption from 3 May to 2 September 2021)

ENVIRONMENTAL

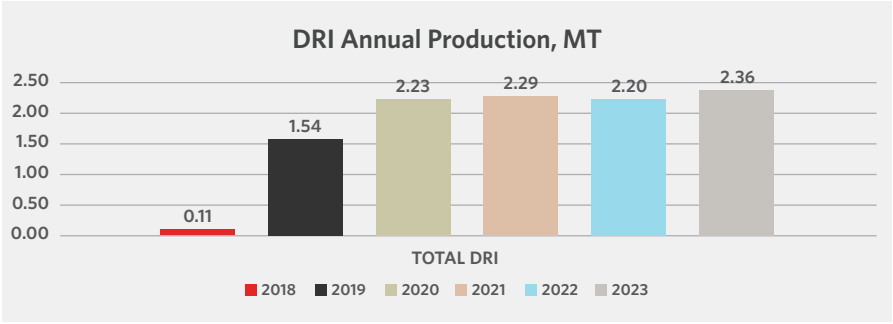
- All solid waste of oxide fines, sludge and mill scale are used in the beneficiation plant

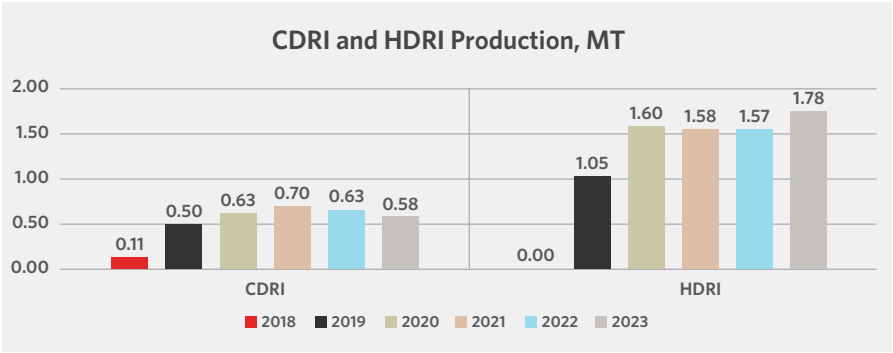
VISION, MISSION, VALUES

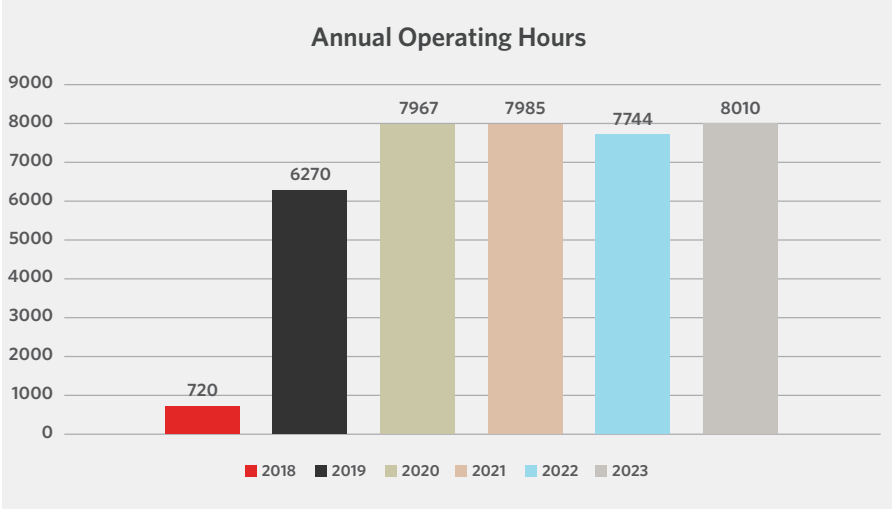
Tosyali Iron Steel Industry Algerie A.Ş. has the same perspective and objectives as Algeria, to promote the country's mineral wealth, participate in the development of the high value-added steel industry, create jobs around this sector, strengthen the skills of human resources, eliminate dependence on imports, and move towards export.

It is our basic social responsibility to use the world's resources efficiently, not to be insensitive to social problems, to contribute to the development of the human resources of our country, and to fulfill our duty towards the institutions, organizations and non-governmental organizations that make efforts in this direction.

The commitment to sustainable societal and cultural projects reflects the human dimension of our company, the enhancement of skills and natural resources while respecting the environment and the performance of our industry. They serve as resolute steps towards our current and future success.







Note: Figures for 2023 in all three graphs are estimates.

SAFE SHIPMENT OF HBI

HBI C-FLEX PROJECT & IMO REGULATORY UPDATE

By CHRIS BARRINGTON, *Chief Advisor, International Iron Metallics Association (IIMA)*

INTRODUCTION

The main focus of this article is the HBI C-Flex project, which was the subject of an article in the 3Q2021 issue of DFM. The article will also highlight recent International Maritime Organization (IMO) regulatory developments affecting direct reduced iron (DRI) and briefly describe the so-called Safe H-DRI project, which is focused on rail/barge as opposed to international maritime transport.

Since the 3Q2021 DFM article introducing the HBI C-Flex project, the project has moved from concept to reality with a defined scope of work, identification of scientific partners to undertake the various work packages, financial support from the EU Research Fund for Coal and Steel (RFCS), and an evolving administrative structure. The formal start date was July 1st 2023, and preparations for the scientific and technical work are under way. The planned project timescale is 42 months, taking it to end 2026. This article will outline the project goals and the various work packages.

BACKGROUND

There has been a strong response to HBI C-Flex from across the global iron ore-to-steel value chain with intent to participate from several iron ore producers, DRI/HBI producers (actual and prospective), technology suppliers, plant builders, and steel companies. It is hoped that by the time this article is published, the administrative structure and processes will have been finalised.

In the previous article (3Q2021 DFM), we described the genesis of the project and the background to future growth in global DRI demand along the pathway to carbon-neutral steelmaking. Over the subsequent two years this pathway has become better defined and it is clear that DRI and HBI have a major role to play, with hydrogen-based reduction of key importance. Also increasingly well understood is the probability of a shortfall in

supply of high grade iron ore, one of the solutions to which is use of lower grade (blast furnace) pellets as DR plant feedstock, with the consequence for HBI of lower density and potentially higher reactivity and thus, like DRI, a propensity to self-heat.

Much spoken about is the possible decoupling of iron and steel production in some parts of the world, implying increasing maritime transport of HBI, underlining the relevance of HBI C-Flex.

HIGH LEVEL OBJECTIVES

The ultimate goal of the project is to facilitate future safe handling and shipment of HBI. Through science-based understanding of the drivers of reactivity, methodology and predictive tools to assess and quantify the inherent parameters and risk factors will be developed. This will, in turn, enable adaptation of the regulations governing maritime transport to mirror future developments in production and quality of HBI and thus facilitate the anticipated growth of international seaborne trade in HBI.

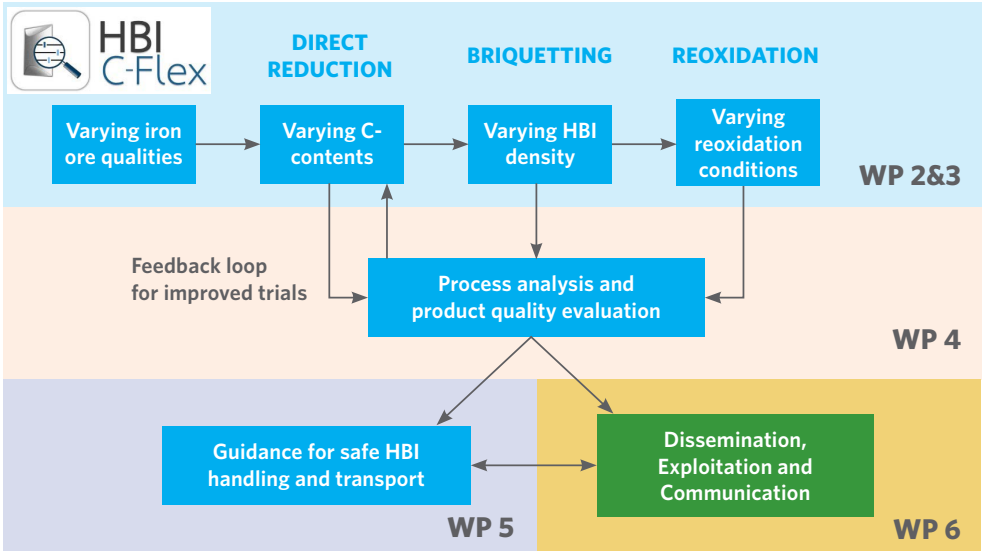
WORK PACKAGES

There are six work packages. **WP #1** is Project Management & Coordination, the responsibility of **K1-MET**, one of the leading and internationally renowned metallurgical competence centres for ferrous and nonferrous metallurgy, based in Leoben and Linz, Austria. Constituents of **WP #1** are project management, administrative and financial management, quality assurance, risk management, and data management.

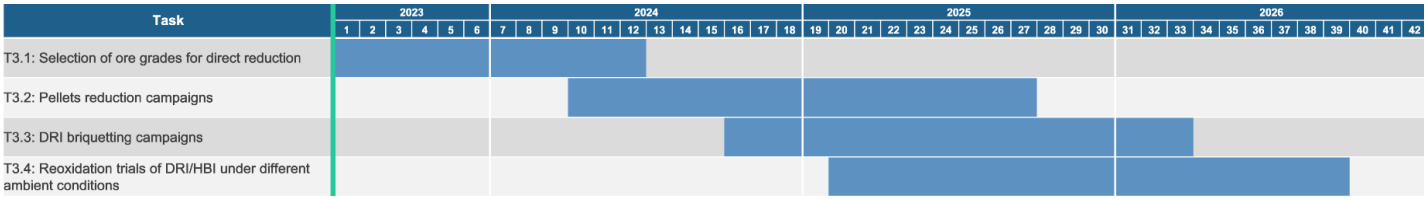
WP #2-6 and their interactions are illustrated in the graphic below. **WP #2** covers design of the HBI production and reoxidation processes and is coordinated by the Ferrous Metallurgy Department at the Montanuniversität Leoben in Austria. Key components are:

- adaptation of existing laboratory reduction reactors (at CRM's facility in Belgium and the ArcelorMittal Maizières Research facility in France);
- adaptation of an existing lab-scale hot briquetting system to produce HBI with certain and consistent quality (at Institute of Thermal-, Environmental- and Resources' Process Engineering [ITUN], part of the Technische Universität Bergakadamie Freiberg, Germany);
- design and construction of the lab-scale corrosion system for reoxidation studies.

WP #3 following on from **WP #2**, covers experimental ore reduction, hot briquetting, and HBI reoxidation studies and is coordinated by ArcelorMittal Maizières Research. Selection of iron ore pellets is one of the first steps and, in principle, six types of pellet (BF and DR grade) will be tested under varying reduction and briquetting conditions. The planned timeline for **WP #3** is shown in the Gantt chart on the next page.



Work packages (WP) #2-6 and their interactions



The planned timeline for WP #3

WP #4 which will be coordinated by voestalpine Stahl Linz, covers process analysis and product quality evaluation. Key components are:

- modelling carbon prediction of DRI/ HBI;
- chemical analysis of DRI/ HBI, before and after reoxidation;
- determination of physical properties of DRI/ HBI – density, mechanical strengh, porosity;
- determination of morphological properties.

WP #5 will be coordinated by Primetals Technologies and covers:

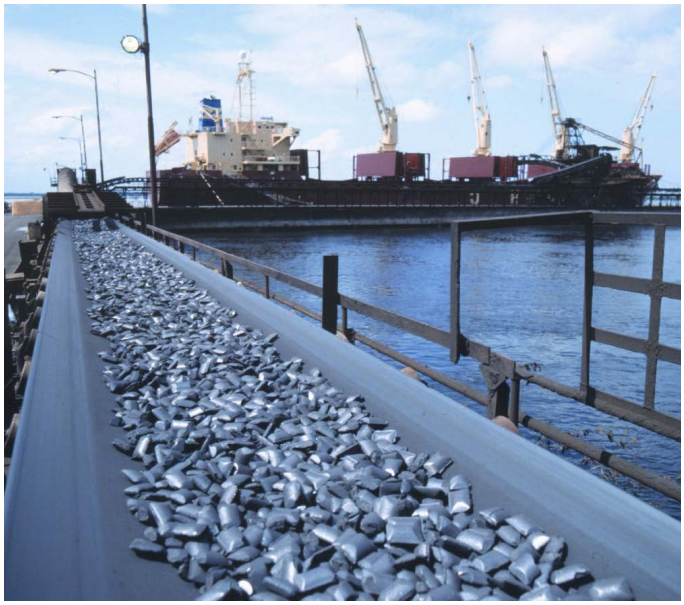
- development of recommendations for the HBI production process and parameters so as to reduce reactivity;
- development of guidance for safe handling and transport of HBI.

WP #6, is to be coordinated by **K1-MET** and covers Dissemination, Exploitation and Communication (DEC). This work package to a significant degree reflects the very detailed obligations under the RFCS funding agreement whereby project information, progress, results, etc. should be shared with key stakeholders through workshops, articles and presentations, and a dedicated website. The first step is development of a DEC strategy to which all project participants will contribute. The project website is under development and is planned for launch by end November 2023.

A key stakeholder is the IMO's Sub-committee on Carriage of Cargoes and Containers (CCC, which is responsible at working level for the IMSBC Code [International Maritime Solid Bulk Cargoes Code] and reports to the top-level Maritime Safety Committee). It is essential that CCC be informed about the project and its progress.

BEYOND HBI C-FLEX

Having established the project objectives, it will be necessary to validate the results established at laboratory scale at industrial scale. Plans for this will be established in due time. A roadmap for implementation of any necessary amendments to the IMSBC Code will also need to be developed – the process of updating and amending the Code can be very lengthy, especially for DRI, which has a high profile at the IMO.



OTHER IMO DEVELOPMENTS

- IIMA submitted a paper to CCC for its meeting in September 2023, proposing amendments to the existing IMSBC Code schedule for Direct Reduced Iron (A) – i.e. HBI – with the aim of strengthening some of its provisions in the interests of better ensuring safe shipment. For example, the requirement for density of 5,000 kg.m^3 should be mandatory rather than advisory or recommendatory, as it now is. Also, some of the provisions of the loading section (which are mandatory) could be improved. This is work-in-progress. A copy of IIMA's paper can be provided to interested parties.
- IIMA proposed some minor modifications to all three of the DRI schedules, correcting some errors in threshold ranges for certain quality parameters. These were accepted and will be incorporated into the next edition of the Code. Details are available on request.

- Following on from the article "Charting a Safer Course for DRI Fines" in the 4Q2022 edition of DFM, it is extremely gratifying to advise that the proposed IMSBC Code schedule for Direct Reduced Iron (D) (By-product fines with moisture content of at least 2%) was finally approved by IMO's Maritime Safety Committee at its meeting in June 2023, and will be included in the next edition of the Code, which comes into legal effect from January 2025, but with voluntary adoption possible from January 2024. The schedule can be downloaded from IIMA's webpage https://www.metallics.org/logistics-guides.html.

SAFE H-DRI PROJECT

Another project entitled "Safe transport of DRI from H_2-based direct reduction considering quality-related H-DRI reactivity, stability, and the efficiency of passivation methods" (abbreviation: Safe H-DRI) has been submitted for financial support from RFCS. This project is focused on hydrogen-reduced DRI transported by rail or barge, as a number of direct reduction plants will be constructed in the EU with DRI to be transported to remote steel plants; for example, from ArcelorMittal's planned Bremen DR plant to its steelworks at Eisenhuettenstadt, a distance of more than 400 km by rail.

The proposed project scope includes the following:

- design of specific containers for transport of DRI by rail, barge, etc.;
- investigation of reoxidation behaviour of H-DRI under conditions representative of transport, using a variety of iron ores as DRI feedstock;
- quantification of crack formation and fines generation during handling;
- establishment of the correlation between H-DRI properties, hazards and risks, and identification of critical factors for safe transport;
- quantification of passivation methods for H-DRI;
- standardisation of transport systems and update of applicable transport guidelines in the context of the behaviour of H-DRI.

Project partners are representative of the DR value chain, ranging from ore selection/processing, plant engineering and building, integrated and EAF-based steelmaking, as well as DRI logistics, along with relevant scientific institutions. The outcome of the funding application is expected to be in Q1/Q2 2024.

→ The author of this article can be contacted at **cbarrington@metallics.org**

Midrex News & Views

The full news articles are available on **www.midrex.com**

MIDREX AND KOBE STEEL CELEBRATE
40 YEARS OF TEAMWORK & COOPERATION

This year marks the 40th anniversary of Kobe Steel Ltd. (KSL) acquiring the assets of Midrex Corporation from Korf Industries, Inc. Throughout 2023, Midrex has held events to commemorate joining the Kobe Steel Group (Kobelco Group). On September 19, Kobe Steel President & CEO Mitsugu Yamaguchi, Masahiro Motoyuki, Executive Officer, Head of Engineering Business, Kobe Steel USA President Kotaro Ueno, and former Midrex Presidents Winston Tennies and Jim McClaskey joined Midrex teammates for a celebratory event in Charlotte.

"Midrex and Kobe Steel have common goals and a mutual belief in each other," Mr. Yamaguchi said. "As the market becomes more complex, this sound relationship will become more and more important."

Mr. Yamaguchi told the group that "CO_2 reduction is a major challenge to the steel industry, and Midrex and Kobe Steel already have technology to meet the needs of the Hydrogen Society.

"It is our mission to provide solutions to the needs of society by making the best use of our employees and technologies."

Midrex CEO Stephen Montague echoed Mr. Yamaguchi's remarks in saying, "Trust is the key to the success of Midrex," and former Midrex President Winston Tennies thanked Kobe Steel "for taking the long-term view and placing confidence in the management and employees of Midrex."

(l to r) KC Woody, Mitsugu Yamaguchi, Stephen Montague, Masahiro Motoyuki

Midrex News & Views

The full news articles are available on **www.midrex.com**

MIDREX® Plants with 4th Quarter Anniversaries

Midrex is known for designing, engineering, and servicing reliable direct reduction plants, as well as for making certain that these plants have long and successful operating lives. This issue of ***Direct From Midrex*** recognizes the start-ups of Oskol Electrometallurgical Kombinat (OEMK) I in Stary Oskol, Russia (40 years) and Tosyali Algerie in Bethioua (Oran), Algeria 1 (5 years).

OSKOL ELECTROMETALLURGICAL KOMBINAT (OEMK) I

Oskol Electrometallurgical Kombinat (OEMK) I started 40 years ago in 4Q.

Location:
Stary Oskol, Belgorod Region, Russia

DR Process:
MIDREX®
- Start-up: December 1983
- Flowsheet: MIDREX Flex™
- Product: CDRI
- Rated Capacity: 0.42M t/yr

Modifications:
- Oxide coating
- Oxygen injection
- Thin wall refractory
- 250mm reformer tubes
- Heat recovery upgrade

Read more about OEMK at:
https://www.metalloinvest.com/en/business/steel/oemk/

(OEMK I pictured in the foreground)

The Ministry of Foreign Trade of the former USSR and a group of West German companies signed a joint venture agreement in 1974 to establish an integrated metallurgical complex in Stary Oskol, near the vast iron ore resources in the Kursk area. Oskol Electrometallurgical Kombinat (OEMK) would be based on direct reduced iron (DRI) via the MIDREX Process and electric arc furnace (EAF) steel production. Construction began in 1978, and the first products, oxidized pellets, were produced in 1982. DRI production began with start-up of the first of four MIDREX Modules in 1983, and the first steel was produced by the EAF melt shop in 1984. OEMK has been a part of the Metalloinvest Holding since 2006.

Cumulative DRI production by OEMK's four MIDREX Modules, which started production between 1983-1987, is more than 82.2 million tons. OEMK I alone has accounted for more than 23 million tons of the total, with metallization averaging 94.2% and annual operating hours averaging close to 8,000.

Midrex News & Views

The full news articles are available on **www.midrex.com**

MIDREX® Plants with 4th Quarter Anniversaries

TOSYALI ALGERIE MODULE 1

Tosyali Algerie Module 1 was started up five years ago in 4Q.

Location:
Bethioua (Oran), Algeria

DR Process:
MIDREX®

- Start-up: November 2018
- Flowsheet: MIDREX Flex™
- Product: HDRI/CDRI
- Rated Capacity: 2.5M t/y

Read more about Tosyali Algerie at:
https://www.tosyali-algerie.com/

The Tosyali Algeria iron and steel complex is located in the industrial zone of Bethioua, 40 km east of Oran, covering 4 million square meters with easy access to the Mediterranean Sea. The integrated works includes a 4 million tons/y (Mt/y) pelletizing plant, 2.5 Mt/y MIDREX Combination (HDRI/CDRI) Plant, 3.7 Mt/y EAF melt shop, 2.3 Mt/y continuous casting machine, and 4.0 Mt/y rebar & wire rod rolling mill. When the fourth development phase is completed in 2024-25, Tosyali Algeria will add a second 2.5 Mt/y MIDREX Plant capable of operating with increased percentages of hydrogen. HDRI will be fed via a hot transport conveyor to a new 2.4 Mt/y EAF melt shop with downstream facilities to produce flat products.

In 2020, its second full year of operation, Tosyali Algerie set the world record for annual DRI production (2,233,444 tons) and bested it in 2021 (2,285,123 tons). Other significant achievements include:

- Monthly production of 227,739 tons (November 2022)
- Hourly production of 316.3 tons (November 2022)
- 1000+ hours of continuous operation achieved four times
- 2000+ hours of continuous operation achieved two times
- Almost 8.4 million tons produced since initial start-up (November 2018)
- Average metallization 93.7%

Quality Management System Excels In 5th Surveillance Audit

Ten processes of the Midrex Quality Management System successfully completed the 5th Surveillance Audit" in October, with Licensee Technical Services, Project Execution, and overall Quality Systems Auditing earning strength statements. Additionally, Midrex India and Midrex UK were successful in the audits of their overall operations.

The auditor found that Midrex Licensee Technical Services and Project Execution, "work together to develop customer projects. The processes used and interactions documented are very well defined, communicated, distributed, continually revised and updated."

The manner in which Midrex applies Quality Systems Auditing was applauded as "the most comprehensive and robust IA program this auditor has assessed. It is very effective and is well documented and supported by the Senior Leadership Team (SLT)."

The next audit, which will include all company business processes, is for recertification and is tentatively scheduled for April 22-26, 2024.

Lauren Lorraine: **Editor**

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