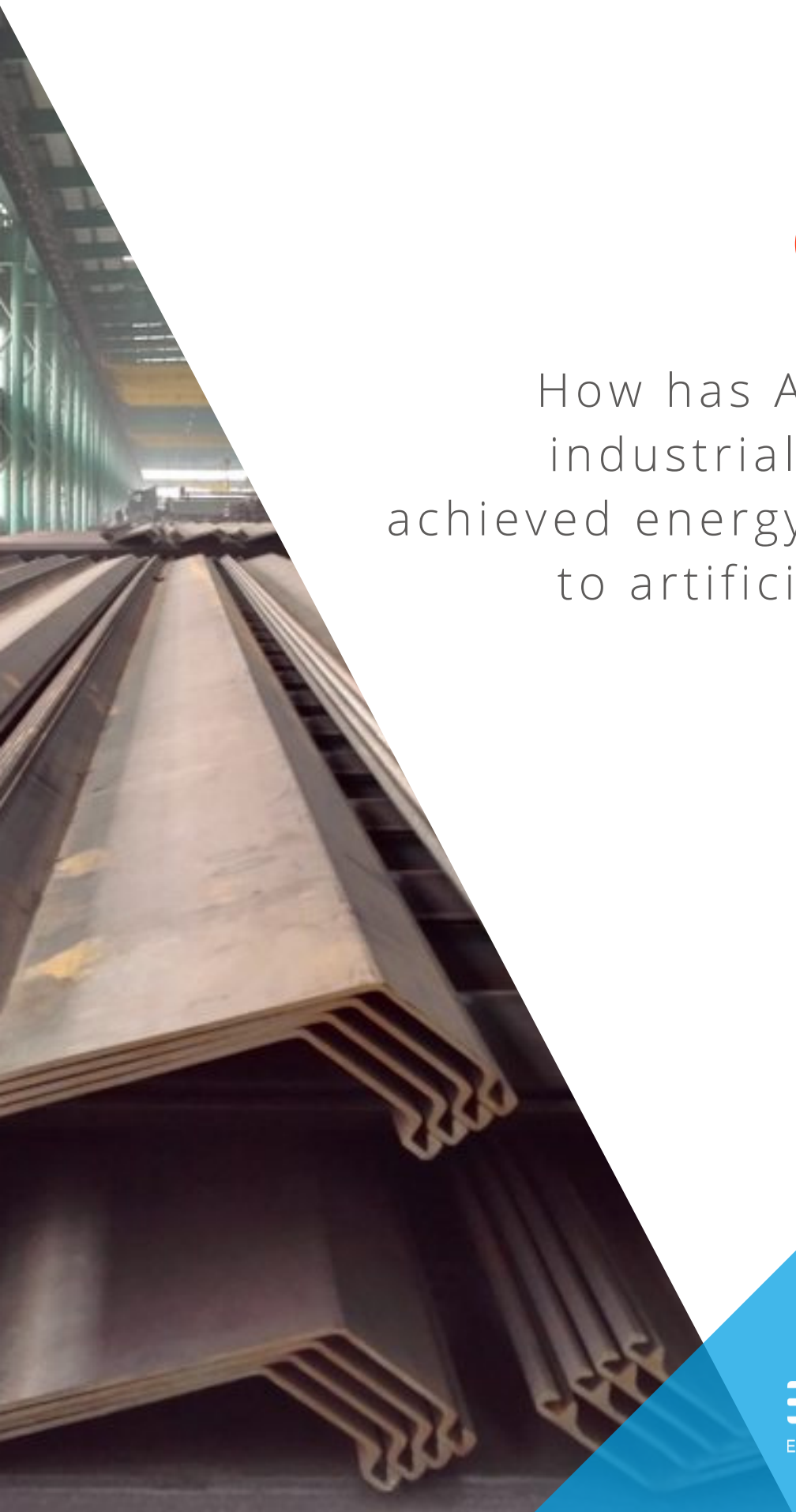
ArcelorMittal



Success Story

How has ArcelorMittal, an industrial leader in steel, achieved energy savings thanks to artificial intelligence ?

ENERGIENCY

ENERGY INTELLIGENCE FOR MANUFACTURING

ArcelorMittal presentation

World leader in steel production, with 96 million tons produced in 2018, the steel group ArcelorMittal has 209,000 employees in more than 60 countries and has around **100 plants worldwide**. ArcelorMittal's turnover reached €64 billion in 2019.

In Luxembourg, the **ArcelorMittal site "Belval"** is an integrated plant with three shop floors: an electric steel mill, a rolling mill to produce beams and angles, and a second rolling mill to produce sheet piling (large steel bars designed to retain earth or water to create quay walls, dikes, underground parking lots, tunnels, bridges or roads).

The challenge for ArcelorMittal

With consumption of approximately 600 GWh of electricity and 800 GWh of gas, the Belval site is particularly **energy-intensive**. The largest gas consumers are **the two beam furnaces** for reheating before rolling (approximately 300 GWh each). The challenge proposed by ArcelorMittal Belval was to test the value of a digital tool and artificial intelligence to improve the **energy performance of the furnace of one of the two rolling units, consuming €5M of gas per year.**

The energy performance of the furnace is closely monitored by a **dedicated energy manager**, assisted by ArcelorMittal reheating furnace control experts.

Among the group's challenges, **leadership, modernization of the production tool, control of the carbon footprint, and sustainability** are key strategic goals: any transformation opportunities (e.g. industry 4.0) are considered. Eager to optimize their **energy efficiency**, ArcelorMittal Belval decided to launch this dedicated project in 2018.

The meeting with Energiency

ArcelorMittal was looking for:
- an **easy-to-use** application for production departments, maintenance, or field-operators.
- a tool that allows them to **analyze their data** in order to measure the impact of their actions on energy savings, and to obtain associated **recommendations.**
- a solution with a **return on investment in less than 2 years.**

The energy supplier of the Belval site, SOTEL, had identified Energiency as an industrial energy performance software and put them in touch in 2018.

The methodology implemented

Phase 1: Energiency initiates its study of **the energy savings potential,** based on historical data. ArcelorMittal and Energiency co-processed more than **1600 data streams** from the furnace, with a time step of 1 second over 1 year ("Big Data" project).

Phase 2: Energiency proposes a **machine learning model of gas consumption,** based on different production parameters (the used material, layout, type, length, etc.). The model reaches **a reliability of 98%**. The **potential gain** announced by Energiency is **2% per year on a 5M€ bill, i.e. 100.000€ per year.**

Phase 3: After being approved by the maintenance and technical managers, Energiency receives the "Go" to **put the model into production and to accompany ArcelorMittal** in the calculation of KPIs and the identification of the factors influencing energy performance. Through collaboration with Energiency, important production results were achieved in the first two years. In the first year, an operational problem due to the deposition of a cinder layer in the furnace was identified, the proposed parameter changes of the furnace operation were implemented, and furnace shutdowns were avoided. In the second year, the model was further improved by new data, for the detection of new energy-saving measures (3%).

Phase 4: Collaboration on **new statistical studies** to identify new sources of energy savings.

Noticeable results in less than 2 years

After several **iterations** of adjustments and updates of the model, to always take into account new influencing parameters, real energy savings have been achieved: the ArcelorMittal site Belval **saved more than 3% on its energy bill** with the support of Energiency, exceeding the initial objective and represents:
- €150,000 on the annual energy bill,
- a saving of 9 GWh on annual energy consumption.

In addition, one of the prerequisites for the implementation of a 4.0 tool was that the technology is adopted by production operators. Energiency's artificial intelligence methods enabled the ArcelorMittal Energy team to have **better technical collaboration** and **improved dialogue** between the production and maintenance teams.

Also, the application and studies offer more opportunities to have **different views on the analysis** which can then be turned into energy practices, as well as a **real share of knowledge** with other sites of the group.

> *The Energiency team is very dynamic and answers perfectly our requests, offering us statistical studies that we cannot do internally because of a lack of skills. The ArcelorMittal teams are totally confident in Energiency when seeing concrete actions put in place and the gains obtained thanks to the studies and the software. When I work with Energiency, I don't feel that there is any difference between us. The quality of the work is really excellent.*
>
> **Souad Mejri,** Environmental & Energy Engineer at the ArcelorMittal site Belval

Day-to-day support

Daily reports with AI results are automatically sent to ArcelorMittal operational staff (production, maintenance, energy) by the Energiency application, in order to provide **performance indicators** and **recommendations** on daily, weekly, and monthly usage to be implemented.
Via the application, ArcelorMittal teams can also visualize quickly possible **operational problems of the furnace in case of energy performance drifts** and directly analyze them together with Energiency.

During the meetings with Energiency's Data Scientists and Energy Managers, new areas of work and consumption optimization are discussed. The AI model is regularly updated, allowing new furnace settings to be discovered.

The next steps

On the Belval site, ArcelorMittal wishes to continue to progress by **seeking new energy savings** through the evolution of the model. In addition, the group wishes to extend the project **to other sites.**

> *I am confident that with Energiency's artificial intelligence models and studies, new ideas will emerge to make us even more energy efficient. We haven't yet considered the heat balance aspect, which is something we want to integrate into our collaboration with Energiency, particularly at other industrial sites.*
>
> **Souad Mejri**, Environmental & Energy Engineer at ArcelorMittal Belval site

Conclusion

The example of ArcelorMittal proves that significant budget savings can be achieved through the search for energy performance. For ArcelorMittal, the return on investment was realized in less than six months, due to the close and regular collaboration between the teams, and the model adjustments made during the partnership.

> *Thanks to the analysis of historical data, you helped us to identify an unexpected loading mode of the furnace. Your graphs clearly show a significant gain of more than 3% compared to our traditional loading mode.*
>
> **Souad Mejri**, Environmental & Energy Engineer at ArcelorMittal Belval site

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