AI tool demonstrates potential for steelmakers to achieve green growth

A software startup has developed a new AI platform which has demonstrated the potential to help steelmakers reduce energy and CO_2, while improving productivity and profit.

Deep.Meta, based in London, collaborated with a consortium which included the Materials Processing Institute, steel re-roller Spartan UK and construction firm Grosvenor as part of the Made Smarter Innovation's Sustainable Smart Factory programme.

The R&D project developed and tested Deep.Meta's flagship product the Deep.Optimiser which uses factory data across multiple processes to inform decision-making.

It has demonstrated the potential to reduce energy consumption by 24 kilowatt hours per tonne of steel, cutting 5% of CO_2 emissions, and shown in simulations to improve productivity by 20%.

Deep.Meta has now secured its first UK customer and has attracted investment from the US.

Chris Needham, Innovation Lead for Made Smarter Innovation, said: *"Developing new digital innovations to improve the sustainability of manufacturing processes is vital for industry to achieve a net zero future.*

"Deep.Meta's application of AI on steelmaking, one of the world's most energy intensive sectors, is an extraordinary example of what can be achieved by bringing together technology innovators and industry, and has far reaching potential."

THE INSPIRATION
Steel is the world's most widely used engineering metal. But traditional manufacturing processes are extraordinarily energy intensive, accounting for 8% of global CO_2 emissions[1].

One opportunity lies in enhancing efficiency by accurately predicting material temperature in furnaces to prevent excessive heat usage during production.

Osas Omoigiade, Founder of Deep. Meta, said: *"There's a lot more waste energy than there ought to be because many steel producers are not able to leverage their existing data in a way that accounts for the interdependence of their processes. With well-informed, actionable insights that account for these complexities they could significantly reduce their energy consumption and production costs."*

THE INNOVATION
The project focused on downstream production activity where furnaces reheat semi-finished steel to be rolled into a finished product. Testing took place at MPI's Green Steel Centre, a research lab for decarbonising steel production, and Spartan UK's Gateshead plate mill.

Deep.Meta developed an AI architecture that replicates the dynamics of a plant by building up a digital framework using reusable modules, each representing key assets. The result is the Deep. Optimiser which generates recommended actions to optimise the production process in real-time.

For the Spartan plant, these recommendations indicate when steel is at the correct temperature for processing, based upon the material's properties like the grade, combined with live data from furnace sensors, such as gas flow and the forecasted behaviour of the product under processing in subsequent stages.

Leveraging historical and live data, an effective digital twin of the process was constructed in which the AI agents - the intelligence in the software - were trained with 40 years' worth of production cycles.

The AI then alerts shop floor operators when products should be removed from furnaces. The cloud-based app, accessible via the web or tablet, then provides steel producers with recommendations to optimise productivity and energy efficiency.

THE IMPACT
Deep.Optimiser demonstrated it can reduce energy consumption by 24 kilowatt hours per tonne of steel. For a manufacturer producing 2M tonnes per year, that equates to a reduction of 48 terawatt hour (TWh) - the collective equivalent of the energy used by over 3,000 homes a year in the UK.[2]

The tool achieved a CO_2 saving of almost 5% of the reheating and finishing process, based on 200kg of CO_2 per tonne of steel emitted at this stage out of 2,000kg per tonne of steel across steel production. Deep.Optimiser also showed potential to improve productivity by 20%.

Dr Omoigiade said: *"The potential gains for this plant are very exciting. Reducing the energy and the CO_2 per tonne of steel means being able to produce more with a lower unit cost per product, improves the margins significantly.*

"This technology has huge implications for supporting the UK steel Industry in building resilience and bringing down costs, it's an industry vital for national security and infrastructure. "But the big picture is that if the Deep. Optimiser is used across all 1,600 steel plants globally, we could see a reduction in global emissions of around 500 megatons every year. That's the equivalent to a 20% reduction in the overall CO_2 associated with steel production."

The project also helped Spartan UK introduce new digital processes and improve the digital skills of their workforce.

Dr Omoigiade said: *"Building familiarity and trust in the technology has been vital. One operator, who has been there for 30 years, told me that this tool made his job five times faster, reducing the risk of operator errors. That sort of feedback is fantastic and epitomises the potential for introducing technology and new operating methods to a legacy industry."*

Deep.Meta has now secured its first UK customer, using Deep.Optimiser on a production line. Meanwhile, the company has attracted additional investment from the US, doubling its workforce.

Dr Omoigiade said: *"Made Smarter Innovation has proven to be a game-changer, not just for our business, but for the steel industry. Bringing together partners to test new technologies is vital for us to tackle critical environmental challenges while enabling vital industries to remain competitive, resilient and achieve sustainable growth."*

1. www.iea.org
2. www.ofgem.gov.uk

Deep.Meta

1   https://www.iea.org/reports/emissions-measurement-and-data-collection-for-a-net-zero-steel-industry/executive-summary

2   https://www.ofgem.gov.uk/average-gas-and-electricity-usage