Decarbonized steel: pioneer for sustainable innovations

There were times – and they were not so long ago – when a lean environmental footprint was something "nice-to-have" for companies active in the energy sector but by no means a "must-have"

bluemint® steel is a climate-friendly, CO_2-reduced steel which is offered as grain-oriented electrical steel bluemint® powercore®

1. Introduction

Over the past two years, sustainability has developed into a business-critical issue for utility companies, grid operators and transformer manufacturers. EU regulatory requirements are becoming increasingly stringent, and the market is looking for efficient and successful solutions for responding to the ongoing green transformation. thyssenkrupp Electrical Steel supplies one of the key components: CO_2-reduced grain-oriented electrical steel.

A guest article by Marcel Hilgers, thyssenkrupp Electrical Steel.

There were times – and they were not so long ago – when a lean environmental footprint was something "nice-to-have" for companies active in the energy sector but by no means a "must-have". In 2023, the outlook is different: virtually all globally active companies have, in the meantime, set themselves scientifically based emission reduction targets, some of which are highly ambitious. For example, Iberdrola, one of the largest electricity producers within the EU and a real heavyweight in the market, aims to reduce its CO_2 emissions by almost 50 percent by 2030. It is expected that Scope 3 emissions will account for four-fifths of this amount, meaning the proportion that is generated along the entire value chain – and thus also at the suppliers. Moreover, as part of the Steel Zero Climate Group, Iberdrola has committed itself to using production materials that promise particularly good leverage when it comes to climate change mitigation. In this case, we are talking about steel.

2. Increasing pressure from ESG

Many other companies, grid operators and power utilities have also taken the same path, as a result of which the pressure is increasing on suppliers and transformer manufacturers to respond in the right way to the new challenges. To an increasing extent, investments also depend on whether projects meet the client's specifications for aspects of environmental, social and governance (ESG) criteria. All of a sudden, many managers are

asking themselves whether transformer production couldn't also go green – and, above all, how. thyssenkrupp Electrical Steel is leading the way here as a driver of innovation and is developing suitable solutions. The aim is to combine different needs and to offer the industry a product that can be used as the basis for creating new, more sustainable innovations.

One of these products is bluemint steel. This is a climate-friendly, CO_2-reduced steel which is offered in the grain-oriented electrical steel range under the name bluemint® powecore®. In addition, significant innovations in the production network at thyssenkrupp Steel make it possible to reduce the material's carbon footprint by about 50 percent compared to conventional top grades. This corresponds to a reduction of approximately 1.9 metric tons of CO_2 per metric ton of grain-oriented electric steel sheet. thyssenkrupp Electrical Steel also transparently certifies this achievement to the customer via DNV and TÜV Süd reports.

With this new technology, coking coal can be removed from production and replaced by blue and green hydrogen, making the entire manufacturing process much more climate-friendly

3. Hydrogen instead of coal

These CO_2 savings are possible because thyssenkrupp Steel is replacing the classic blast furnace route for steelmaking with direct reduction plants and smelters. The first combination of the world´s biggest direct reduction plant with the smelters was awarded to SMS group at the beginning of March 2023. Total investment into decarbonization of more than 2 B EUR. With this new technology, coking coal can be removed from production and replaced by blue and green hydrogen, making the entire manufacturing process much more climate-friendly. The measure forms part of the Group's green transformation with the ambitious goal of becoming carbon-neutral by 2045 at the latest. The central advantage from the customer's viewpoint: bluemint products are "plug-and-play" solutions, which makes them easy to implement. There is no need for requalification measures because the CO_2-reduced material has the same magnetic and mechanical properties as the tried-and-tested grades. As a result, bluemint powercore can replace any other top-grade GOES on a 1:1 basis – even in existing transformer and core designs.

How well this works in practice is shown, for example, by thyssenkrupp Steel's cooperation with transformer manufacturers such as SGB-SMIT, Siemens Energy and many others. With SGB-SMIT, for

The decarbonization of steel is opening up many new perspectives and opportunities for the energy industry in terms of sustainability

example, bluemint powercore was used in two projects to reduce the carbon footprint of a 120 MVA power transformer and a 400 kVA distribution transformer by between 18 and 40 percent. Another example comes from Siemens Energy, where using bluemint steel in an HVDC transformer saved 240 metric tons of CO_2. It would require 50 solar panels to generate energy for 25 years to achieve the same reduction target.

4. Seizing opportunities together now

The examples given above show how enormous the leverage effect of using the right material can be from an ecological perspective – even leaving aside the potential of recycling content and circularity. This is because steel, in particular, is ideal for recycling: once produced, the material can be reused many times again. And thyssenkrupp Steel is also working flat out to answer the following question: To what extent can old transformer cores be integrated into the production of climate-friendly steel as raw materials in the future? Conclusion: The decarbonization of steel is opening up many new perspectives and opportunities for the energy industry in terms of sustainability. The industry as a whole – from material and transformer manufacturers to grid operators – is now tasked with taking advantage of this, as well as creating transparency and uniform regulations.

Author

Marcel Hilgers

Marcel believes in listening to his customers and creating solutions to serve their true needs. With over 20 years of experience in the global steel business and thereof more than 10 years serving the transformer industry, he now works intensely on the green transformation of both steel and transformers.

Marcel leads the sales, technical customer engineering and communications team at thyssenkrupp Electrical Steel – the European and Indian market leader in grain-oriented electrical steel.

His key priority today is to inform the electricity industry about options to decarbonize the grid and to form alliances across raw material suppliers, transformer makers and electric utilities.