Fact Sheet

How Bosch factories are driving climate action
A selection of exemplary projects

July 9, 2020
PI 11175 RB Cn/Af

Stuttgart, Germany – Green, smart, successful. The future of manufacturing lies in combination: in making obvious connections and harmonizing ecological and economic concerns. This presents companies with immense challenges. With the manufacturing industry accounting for around one-fifth of CO_2 emissions in Germany, for example, attention is turning above all to production processes and the indirect emissions resulting from the external procurement of electricity and heat. In 2019, Bosch emitted around 1.94 million metric tons of CO_2 worldwide (Scope 1+2) – around 90 percent of which arose in production. Examples from Bosch plants in Germany, France, India, Mexico, and Sweden show what measures the company is taking to achieve climate-neutral manufacturing.

Salzgitter and Wernau, Germany – hydrogen as an important building block for the move to alternative energy

In Salzgitter, Bosch is working with the Fraunhofer Institute and other local companies to establish a center for hydrogen, known as the Hydrogen Campus, which is funded by the city and the state of Lower Saxony. A pilot project is investigating the potential of hydrogen to reduce factories' carbon footprint. Hydrogen is regarded as an important building block for the move to alternative energy. Using green electricity, an electrolyzer produces hydrogen and oxygen from water. Hydrogen can replace fuels such as oil or natural gas in the steel and chemicals industries. Used in fuel cells, it can power trains or cars. The Bosch plant in Salzgitter is being used to trial the use of hydrogen an an energy source for factories. The project partners will start building the Hydrogen Campus this year; the ramp-up phase will begin in 2021 with the aim of building a 50 MW electrolysis plant. This will produce around 7,500 metric tons of hydrogen a day, thereby saving up to 41,000 metric tons of CO_2 emissions.

At the Bosch training center in Wernau, a pilot SOFC plant is being taken into operation. SOFC stands for solid-oxide fuel cell. The plant is made up of three

Robert Bosch GmbH
Postfach 10 60 50
70049 Stuttgart

Email Dennis.Christmann@de.bosch.com
Phone +49 711 811 58178
Twitter @BoschPresse

Corporate Department
Communications & Governmental Affairs
Executive Vice President: Prof. Christof Ehrhart
www.bosch-press.com

fuel-cell systems for stationary applications. These will offer a low-carbon supplement to the Wernau plant's existing power supply, as well as help accelerate the development of such distributed energy systems. When compared with the German electricity mix, an SOFC fuel-cell system saves as much as 40 percent of CO_2 emissions, even when running on natural gas. If the fuel-cell runs on hydrogen or green gas, no further direct emissions of CO_2 are caused. An SOFC unit with an output of 10 kilowatts can cover the annual electricity needs of more than 20 four-person households. In the case of the Wernau plant, this means that the three fuel-cell systems can almost completely cover the energy needs of one of the plant buildings.

Homburg, Germany – crunching data to conserve energy and increase efficiency

The Bosch plant in Homburg is edging ever closer to the vision of an energy-efficient, self-learning plant. In the past two years, this location has cut its carbon dioxide emissions by around 4,500 metric tons, and by more than 25,000 metric tons since 2007, by employing digitally connected sensors, self-programmed algorithms, and efficiency conversions on machinery. To achieve this, it followed a "maximum transparency meets technological innovation" approach. The energy management platform developed by Bosch uses data that has been collected from the machinery at some 12,000 measuring points. Associates can track, control, and optimize each individual machine's power consumption. Technical solutions include ventilation of manufacturing shops on an as-required basis, waste heat recovery from various machining processes, and smart consumption management for machinery. In addition, the location is championing the efficiency technology of the future: last year, the prototype of a stationary fuel cell developed by Bosch was put into operation in Homburg. The fuel cell is integrated into the location's energy supply network and covers peak electricity demand.

Reutlingen, Germany – putting waste heat to intelligent use

As the Reutlingen plant conducts its manufacturing operations in fully air-conditioned clean rooms, it requires year-round heating. Until now, this demand has been covered by boilers, with the heat in the summer months remaining largely unused. Now, there is a solution: heat exchangers have been added to the heating network at specific points to systematically lower the temperature curve of the heating circuit and thus allow the available waste heat to be used for heating throughout the entire location. In addition, this saves the energy that was previously used to dissipate excess heat. The boilers now run on an as-required basis and can be switched off for practically the entire summer. This reduces the time that heating systems are in operation from 7,500 hours to 4,000 hours per

year. It also reduces annual energy consumption by 3,000 megawatt hours and carbon emissions by 700 metric tons.

Feuerbach, Germany – people and machines work together to deliver energy efficiency

The Bosch plant in Feuerbach has been in existence for more than a century and lies at the heart of the oldest and biggest Robert Bosch GmbH location. Established in 1909, the Feuerbach plant has steadily and systematically modernized its facilities and consistently improved its energy efficiency. With training sessions in its "Energieerlebniswelt" (energy experience world), a local team focuses on energy monitoring and increasing awareness among the workforce. The plant has pursued heat-recovery, room-automation, machine power shut-off management, and shop-renovation projects with great success. Its energy requirements are down more than 50 percent compared with 2007; its carbon emissions are down 47 percent.

Nashik, India – reducing carbon footprint with power generated on site

In India, Bosch is pursuing carbon neutrality by tapping natural sources of energy. Spurred on by the idea of supplying the location with fully renewable power during daytime hours, the team at the Nashik location began installing its first photovoltaic systems in 2015. It now has 50,000 solar panels in place on roofs, parking lots, and the grounds to generate around 20 percent of the power required by the plant each year. The facility has reduced its carbon emissions by some 25,000 metric tons and saved over 33,000 megawatt hours since 2015. This is equivalent to the power consumed by some 24,500 Indian households. Bosch experts have also developed an eco-friendly solution for cleaning the modules: the water is recycled several times.

Rodez, France – sustainable heating system

Reduce the site's carbon footprint – that was what the team in Rodez in France set out to do when it started making plans in 2009. The location now has a biomass heating plant, up and running since 2013. It burns wood chips obtained from local forestry resources. Rodez uses its power to heat water and generate process heat. On average, the wood chip-fired plant covers 90 percent of the location's heating requirements. It consumes some 6,600 metric tons of wood chips a year. Burning this biomass releases no more carbon than the trees had taken from the atmosphere. The factory has reduced its yearly emissions by around 600 metric tons.

Bosch in Mexico – renewables cover four-fifths of demand

Mexico has revamped its energy policy. A government energy reform program aims to source 35 percent of the country's electricity from non-fossil fuels by

2024. With many hours of sunshine annually and high-wind regions, Mexico's geography and climate are certainly conducive to that goal, providing a solid foundation for change alongside committed support from government and business. Bosch is part of this movement, and has already set a high standard: Power sourced exclusively from the Dominica wind farm in the state of San Luis Potosí covers up to 80 percent of the energy requirements of several Bosch locations in Mexico. Between 2015 and 2019, Bosch Mexico reduced its carbon emissions by 250,000 metric tons.

Mellansel, Sweden – energy-efficient painting technology

One of the most flexible and eco-friendly paint shops in European mechanical engineering is located in Mellansel, Sweden: the Bosch Rexroth plant there paints equipment such as heavy-duty hydraulic motors for recycling plants and raw materials handling equipment. It is also where engines that will subsequently come into contact with salt water are coated with several layers of corrosion-proofing. In this process, the temperature and the ratio of water to color pigments are closely monitored so that excess heat can be recovered. As a result, energy consumption is 75 percent lower than before.

Contact persons for press inquiries:

Connected manufacturing:
Dennis Christmann
Phone: +49 711 811 58178
Twitter: @BoschPresse

Sustainability:
Agnes Mazzei
Phone: +49 711 811 38140
Twitter: @AgnesMazzei

The Bosch Group is a leading global supplier of technology and services. It employs roughly 400,000 associates worldwide (as of December 31, 2019). The company generated sales of 77.7 billion euros in 2019. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT provider, Bosch offers innovative solutions for smart homes, Industry 4.0, and connected mobility. Bosch is pursuing a vision of mobility that is sustainable, safe, and exciting. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to facilitate connected living with products and solutions that either contain artificial intelligence (AI) or have been developed or manufactured with its help. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiary and regional companies in 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. The basis for the company's future growth is its innovative strength. Bosch employs some 72,600 associates in research and development at 126 locations across the globe, as well as roughly 30,000 software engineers.

The company was set up in Stuttgart in 1886 by Robert Bosch (1861-1942) as "Workshop for Precision Mechanics and Electrical Engineering." The special ownership structure of Robert Bosch GmbH guarantees the entrepreneurial freedom of the Bosch Group, making it possible for the company to plan over the long term and to undertake significant upfront investments in the safeguarding of its future. Ninety-two percent of the share capital of Robert Bosch GmbH is held by Robert Bosch Stiftung GmbH, a charitable foundation. The majority of voting rights are held by Robert Bosch Industrietreuhand KG, an industrial trust. The entrepreneurial ownership functions are carried out by the trust. The remaining shares are held by the Bosch family and by Robert Bosch GmbH.

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