Sustainable Steel Production

Steel production generates a considerable volume of emissions worldwide. These include greenhouse gases, fine particulates, sulfur oxides, nitrogen oxides, and organic emissions. In view of the constantly increasing demand for steel, environmentally friendly new technologies in this industry are making a huge contribution to climate protection. Dr. Alexander Fleischanderl has invented a process that reduces by more than 90 percent the harmful emissions generated during the manufacture of sinter, one of the most important iron carriers in the blast furnace process.

The global use of steel is increasing by about 3 to 4 percent annually. In 2012 approximately 1.55 billion tons of steel were used. About 1.8 tons of CO_2 are generated per ton of crude steel produced via the integrated steelmaking route. The steel industry is responsible for about seven percent of global greenhouse gas emissions. The production of sinter, during which the finely powdered iron ore is baked together with other materials, consumes a great deal of coal-based and gas-based energy and also generates dust, heavy metals, sulfur oxides, nitrogen oxides, and organic emissions such as dioxins. Fleischanderl and his colleagues have developed a process called MEROS (Maximized Emission Reduction Of Sintering), which filters almost 99 percent of the pollutants out of the exhaust gases. Siemens Industry has set up a treatment plant for sinter exhaust gas in the steel mill of voestalpine AG in Austria. The heart of this plant is a 56-meter-high reactor with a diameter of ten meters and ultramodern filtering, blowing, electrical, measuring, and control technology. The MEROS process injects absorption and desulfurization agents in several successive “dry” steps. These agents rapidly bind sulfur oxides and metallic and organic pollutants, which are subsequently almost completely filtered out of the sintering exhaust gases, together with the resulting fine particulates. In this way the plant cleans one

million cubic meters of exhaust gases per hour; that's equivalent to the volume of a cube with sides that are 100 meters long.

Many hundreds of sintering plants are operated all over the world. "At each one of these plants, hundreds of tons of fine particulate emissions and thousands of tons of sulfur dioxide emissions could be avoided annually. A tremendous potential for environment protection is dormant here," Fleischanderl explains. To date, Siemens has built three turnkey MEROS plants in Austria and China. Three more have been ordered, and additional ones are in the decision phase. The tremendous significance of this new process has already won Fleischanderl the Austrian Future Award and the Siemens Environmental Award. Fleischanderl, an expert in the field of environmentally friendly steel production, studied technical chemistry and business management at the University of Applied Sciences in Linz and completed his doctorate at Graz University of Technology. In 1997 he began to work at Voest-Alpine Industrieanlagenbau, the predecessor of today's Siemens VAI Metals Technologies. After working in the areas of research and development, sales, and project management, Fleischanderl is today the Director of Technology and Innovation Manager for the ECO Solutions Group at Siemens VAI Metals Technologies in Linz, Austria. In this capacity he is in charge of all "green" business solutions such as gas purification, recycling, and energy efficiency, as well as the area of steel production and long rolling. "My professional focus is on forging ahead with environmentally friendly solutions," he says. About two thirds of his 91 individual patents in 19 IPR families aim to improve environmental protection in the steel industry. In the course of his employment at Siemens VAI Metals Technologies, Fleischanderl has registered a total of 13 inventions since 2006.

Fleischanderl envisions promising possibilities for dramatically improving energy efficiency and environmental compatibility in steel production in the future. He points out that Siemens, as an integrated industrial company, has the advantage of being able to take research

findings from other areas, especially Central Research (CT) and the Energy Sector, and apply them directly to new industrial developments for the steel industry. In particular, the intensive development work Siemens is doing in the area of hydrogen electrolysis could lead to a quantum leap in the efforts to shrink the carbon footprint of steel production, he says. That's because, on the one hand, hydrogen can largely replace coal as a reducing agent, and on the other, the hydrogen could also serve as an energy carrier for all heating processes or for the biofermentation of exhaust gases containing CO and CO_2 by means of bacteria to form fuels or basic chemicals. "Of course the precondition is always that the hydrogen is generated from renewable energy sources," Fleischanderl explains.