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## **Methanol as Key for Industrial Symbiosis between Chemistry and Steel**

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Integrated steel mills are industrial parks with coke-, iron and steel making. Their process gases are coke oven gas (COG), blast furnace gas (BFG), and converter gas (BOFG). COG contains more than 60 % H<sub>2</sub> and BFG more than 20% CO<sub>2</sub>. About one half of the produced gases are used for metallurgical heating purposes. The other half is used for electricity production within the steel mills power plant to cover the steel mills demand. Electricity production from BF gas leads to a CO<sub>2</sub> emission in the range of 2.5 kg/kWh which is for instance about 5 times of the electricity mix in Germany. On the other hand it is noticed that the production costs of electricity in steel mills is increasingly becoming higher than externally produced electricity. Therefore it is necessary to look for an alternative process gas utilization within steel mills. Conversion to methanol instead of combustion avoids those CO<sub>2</sub> emissions, is good storable, and gains an interesting value.

Methanol is a universal intermediate in chemical industry to be used for a lot of different products like formaldehyde, acetic acid, dimethyl ether, light olefins, methyl esters etc. which are used for wide variety of products for home, business, personal, automobile, and electronics applications. Nearly 10 mio t/a are consumed In Europe whereas about 3 mio t/a are produced here which means that about 2/3 must be imported from overseas.

It will be shown that the profitability of a PTL application will be enhanced by combining it with the use of industrial by-product hydrogen to an extended PtL application. That will be demonstrated exemplary by its use within the environment of an integrated steel mill showing clearly the value of symbiosis between chemical and steel industry.