

# ENERGIRON Direct Reduction Technology - Economical, Flexible, Environmentally Friendly

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## ABSTRACT

For more than 50 years, HYL (now Tenova HYL) has developed technologies designed to improve steelmaking competitiveness and productivity for steel facilities. The HYL direct reduction (DR) technology, while perhaps the best known, is accompanied by other technologies designed for making steel in more efficient, cost-effective ways. The HYL Process has been improved over generations and the current status of the technology, the HYL ZR (or Self-reforming) Process, was developed to allow reduction of iron ores in a shaft furnace without external gas reforming equipment. This process scheme has the ability to produce High Carbon DRI, which allows producers to obtain maximum benefits of carbon in the steel making process, while for merchant sale of the product, eliminating the need for costly briquetting equipment thanks to its highly improved stability.

The recent alliance between Tenova HYL, Techint and Danieli brings a new brand - ENERGIRON - to the forefront of the direct reduction industry. Current environmental regulations worldwide bring more stringent demands to the design of industrial plant operations of all types. ENERGIRON technology is characterized by its flexible process configuration which is able to satisfy and exceed these requirements. In regions where either the high cost or low availability of natural gas work against this traditional energy source, the process is easily configured to operate using coke oven gas, syngas from coal gasifiers and other hydrocarbon sources. More importantly, the air and water effluents of the process are not only low but easily controlled. Incorporation of selective carbon dioxide (CO<sub>2</sub>) removal systems has been a key factor over the past decade in reducing significantly the emissions levels, providing an additional source of revenue for the plant operator via the captured CO<sub>2</sub>. The high pressure operation and closed system of an ENERGIRON plant combined with the HYTEMP Pneumatic Transport System reduces dust emissions to both air and settling tanks, making the process more economical and environmentally friendly. This paper will review the design configuration and economic impact of these green technologies.

## Keywords

Direct reduction, syngas, COG, High Carbon DRI, CO<sub>2</sub> removal, environment.

## REFERENCES

1. Duarte Pablo, Klaus Knop, Zendejas Eugenio, Gerike Uwe. *DRI production for optimization of fossil primary energies in integrated steel plants, reducing steel production costs and CO<sub>2</sub> emissions*, METEC Conference 2003.
2. UNFCCC, *Greenhouse Gas Inventory Data*. 1990-2004.
3. Duarte P., Knop K. and Zendejas, E., *Technical and economic aspects of production and use of DRI in integrated steel works*, Millennium Steel, 2004, pp. 49-53.