



WASTE HEAT RECOVERY SYSTEM OPERATED IN MIDREX PLANTS IMPROVING TO DIRECT REDUCTION PLANTS

CAPTURE OF WASTE HEAT FROM TOP GAS

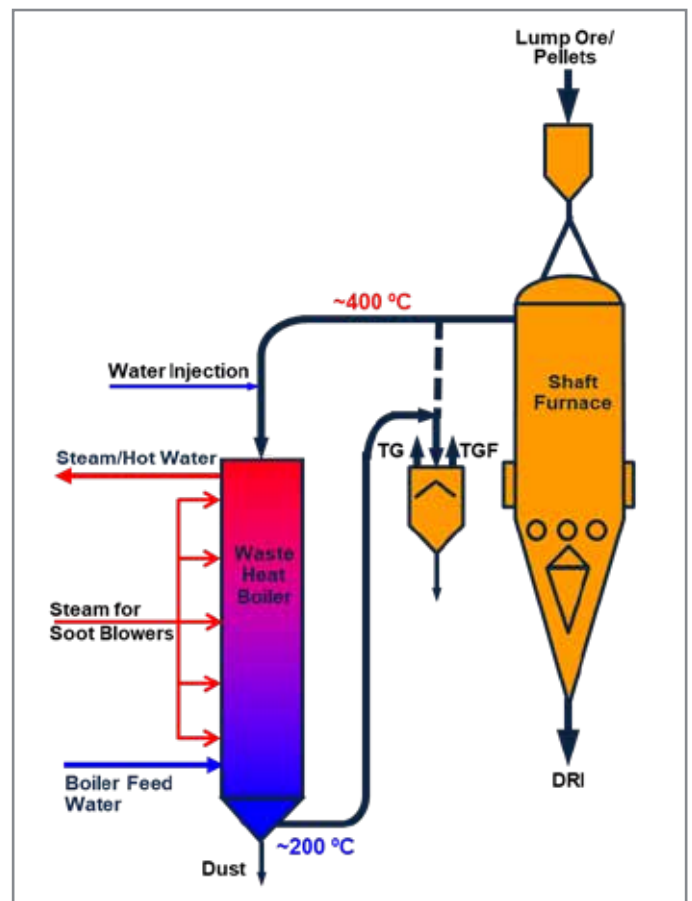
Valuable waste heat from the DR top gas can be recovered and used to produce energy.

TECHNICAL SOLUTION

Dust-laden gas is routed to the waste heat boiler via a refractory lined duct from the top of the boiler to the bottom. Typically the top gas temperature is about 350°C to 400°C, at some plants even higher. Cooled top gas is routed back to the top gas scrubber. Coarser dust is removed at the bottom of the waste heat boiler. For cleaning of the heat exchanger bundles, a soot blower system can be installed.

The heat exchanger can be by-passed by an automatic switch-over, so this system has no influence on the overall availability of the DR plant.

Such heat recovery systems have been engineered by Primetals Technologies and are already installed in smelting reduction plants. Based on the excellent operating results and the similarity of process conditions, the waste heat recovery system described can be adapted for installation in MIDREX DR plants.



Simplified flow sheet of the waste heat recovery system



700 MW Turboden ORC plant at Turboden factory, Flero (Brescia), Italy - 2016; picture by courtesy of Turboden

UTILIZATION OF WASTE HEAT

Captured waste heat in the form of hot water or steam from the waste heat boiler can be utilized for electric power generation:

- Use of waste heat in an Organic Rankine Cycle module

or

- Use of steam in a power plant (as already existing in steelworks) or with a conventional steam turbine

Another option is the direct drive of mechanical equipment.

	recovered energy	specific energy
natural gas-based MIDREX	25 - 30 MW*	105 -115 kWh/tDRI
COREX gas-based MIDREX	25 - 40 MW*	250 -280 kWh/tDRI

* depending on DR plant size

MAIN ADVANTAGES

- Utilization of the valuable top gas waste heat
- Improved energy efficiency of the MIDREX process
- Power generation
 - via ORC module
 - via steam turbine
 - in an (existing) power plant
- High plant availability due to automatic switch-over to the existing wet scrubbing system (on/off-principle)
- Successful implementation in smelting reduction plants

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