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Exclusive agreement maximises waste heat recovery

To curb rising energy costs and reduce water consumption and CO_2 emissions, cement and minerals plant manufacturers are constantly looking for ways to make the plants more efficient.

Waste Heat Recovery (WHR) is just one of the technologies helping energy-intensive industries meet these challenges – and FLSmidth now has exclusive rights to the latest technology for waste-heat-to-power generation.

FLSmidth is renowned for bringing innovative technologies to the global cement and minerals industries. This reputation was strengthened in June 2011 when the company signed a licensing agreement with Wasabi Energy for its Kalina Cycle® waste heat recovery technology. – one of the most efficient waste-heat-to-power systems available. The licensing agreement grants FLSmidth exclusive rights to offer Kalina Cycle technology to the cement and lime industry globally, with the exception of the few countries covered by existing licensees.

Good news for the environment

Particularly in the cement manufacturing process, the preheater and clinker cooler release large amounts of hot flue gases. With the Kalina Cycle technology, the heat in these gases can be recovered and converted into electrical energy. This means new and existing plants are less reliant on traditional power sources, drastically cutting power costs and reducing CO_2 emissions.

Based on a patented ammonia water process, the highly efficient heat transfer rate of the Kalina Cycle can improve thermal efficiency by 10 to 40 percent over conventional steam and organic Rankine Cycle (ORC) waste heat power systems – without harming the environment or interfering with the cement production process.

Greater power generating capacity

Essentially a 'modified' Rankine Cycle, the Kalina Cycle uses a mixture of ammonia and water instead of a pure component working fluid, such as water. Not only does ammonia boil at a lower temperature than water, the ammonia and water mixture boils and condenses across a wider temperature range than water and closely parallels the heat source temperature. In short, the Kalina Cycle allows a higher power generating capacity for a given heat source than other available systems.

KALINA CYCLE PLANT
IN OPERATION

In addition, the ammonia-water concentration can be altered at various points within the power cycle in order to improve the effectiveness of heat acquisition, regenerative heat transfer and heat rejection.

Why use Kalina Cycle technology?

In addition to emission-free power generation and lower water consumption, the Kalina Cycle has a range of other benefits. The Heat Recovery Vapour Generators (HRVG) for the preheater and the clinker cooler exhaust gases are simple heat exchanger/boiler designs, without the need for steam drums. As a result, start-up and shutdown is fast, and tube fouling caused by sticky dust deposits is minimal. To ensure high performance, tube cleaning and dust removal systems are integral to HRVG design. As a result, start-up and shutdown is fast, and tube fouling caused by sticky dust deposits is minimal.

The optimum ammonia-water mix depends on the heat source and cooling temperature. If one or both of these temperatures change, the mix can be easily adjusted to optimise cycle efficiency and power production. In a production plant, seasonal optimisation of power production can be accounted for

TURBO-GENERATOR OF
A KALINA CYCLE PLANT

simply by changing the concentration of working fluid. The HRVG's once-through design means that boiler blowdown is not required to maintain the quality of working fluid. While a steam cycle power plant requires a water treatment system to provide a continuous supply of working fluid, the Kalina cycle system does not.

Used extensively in refrigeration plants and industrial processes, ammonia has a proven safety record backed with well-known safety controls. In the HRVGs, the ammonia-water working fluid is heated directly by the cement plant exhaust gases. There is no need for an intermediate heat transfer loop as required by ORC systems, which improves the WHR plant performance and keeps costs down. Furthermore, ammonia is environmentally benign and does not contribute to ozone depletion or global warming like organic fluids.

KalinaCycle®
Power Generation Technology