Theory of Operation
Simpson Multi-Cooler®

Theory of Operation

The Simpson Multi-Cooler is designed as a continuous heat exchanger operating on the principle of evaporative cooling. In this simple but efficient system, inexpensive air and water are introduced into a mechanically-fluidized mass of sand to achieve maximum contact of the cooling water, air and the sand grain surface – conditions for highly efficient heat transfer. Effective sand cooling must provide two capabilities; intimate, repeated contact of cooling air & water to the hot sand and adequate retention time.

In the Simpson Multi-Cooler, water is introduced into the hot sand while cooling air, supplied by a separate motor-driven fan, continuously purges the sand of water vapor. The air is introduced into the sand mass through multiple outlets in the interior walls of the cooler. Warm, moist air is evacuated from the cooler from the top of the dust hood to your exhaust system. A high efficiency cyclone is typically provided to capture any useful fines in the exhaust stream and return them to the sand system in a controlled manner.

The large volume of retained sand in the Simpson Multi-Cooler is intensively mixed by two counter-rotational crossheads. Each crosshead has four plows that move the sand both horizontally and vertically in a figure-eight pattern through the mixing chamber from the charge point to the discharge point. The counter-rotating plows continuously average the sand condition to produce more consistent temperature and moisture content and to deliver a more

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homogeneous blend to the mixer. The plows also keep the sand highly fluidized, so that the incoming air and water addition can most effectively contact the individual sand grains for efficient cooling.

Retention time is automatically controlled by a variable rate discharge door which is operated by an electro-mechanical actuator. The position of the door is controlled based on the energy consumed by the cooler during operation.

A sophisticated control system utilizes data on the moisture of the sand and the temperature of the exhaust air to provide precise moisture additions to the cooler. Sensors are mounted on each set of mixing tools to continuously monitor the moisture content of the mixed sand. The controller regulates the addition of cooling water to achieve thorough cooling and a residual moisture of, typically, .1.8 to 2.0% +/- 0.3%. The sand has now been cooled, pre-mixed and pre-moistened so that optimal performance from the muller and muller control system can be realized.

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