Case Study
Biomass Combustion Cell

BMA conducted a study on a 25 MW wood chip boiler in order to increase its efficiency, reduce carry-over and eliminate any control irregularity. The boiler uses four Wellon cells.

The objective was to determine how to:

- Reduce the carryover and the frequency of boiler cleanup;
- Reduce convection pass plugging;
- Reduce the formation of clinker on the grate;
- Reduce cell outlet clogging.

Before BMA carried out the tests, several steps had to be undertaken:

- Measuring instruments had to be installed: manometers on each cell's combustion air ducting, manometers on the common air ducting, combustion analyzer, etc.;
- Cleaning of the cells;
- Cell startup according to the existing procedure;
- Stabilization of the boiler operation.

Once this was achieved, observations were made, measures were taken, and conclusions were drawn:

- The quantity of tertiary air entering the cell should be increased in order to reduce the quantity of primary air. This would reduce particle carryover by lower air velocity through the grate. By doing so the total excess air could also be reduced, thus increasing efficiency. CO emissions would also be reduced;
- The tertiary air inlet duct should be reduced in size in order to allow a greater air control;

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- The cell front viewports gave false information on the level of wood chips due to its placement too close to the biomass inlet. They gave the impression of a full grate where the back of the grate was only partially filled;
- Daily cleaning of the grates required intense labor, sometimes in dangerous conditions.

BMA suggested that the modifications be implemented in stages, with objectives for the immediate and short, medium, and long terms.

- Immediate and short terms: install an O_2 and CO analyzer, install reducers on the tertiary air injectors to increase mixing capabilities and use under grate primary air manometers on each cell for biomass flow control;
- Medium term: Modify the tertiary air intake, install actuators on the air dampers of each cell, and automate the mass airflow control with flow meters;
- Long term: Replace the three cells by a vibrating grate which would allow automatic ash disposal, a more efficient operation, the reduction of particle carryover, and the reuse of most of the existing auxiliary equipment. Most importantly, the power could be maintained at 25 MW much more reliably and safely while decreasing the required grate cleaning operations.

Most immediate and short term objectives were accomplished by implementing the respective modifications. Carry over was reduced and a more reliable operation was obtained. It allowed operators to feed the cells more adequately with biomass leading to a more efficient boiler operation by reducing excess air.

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