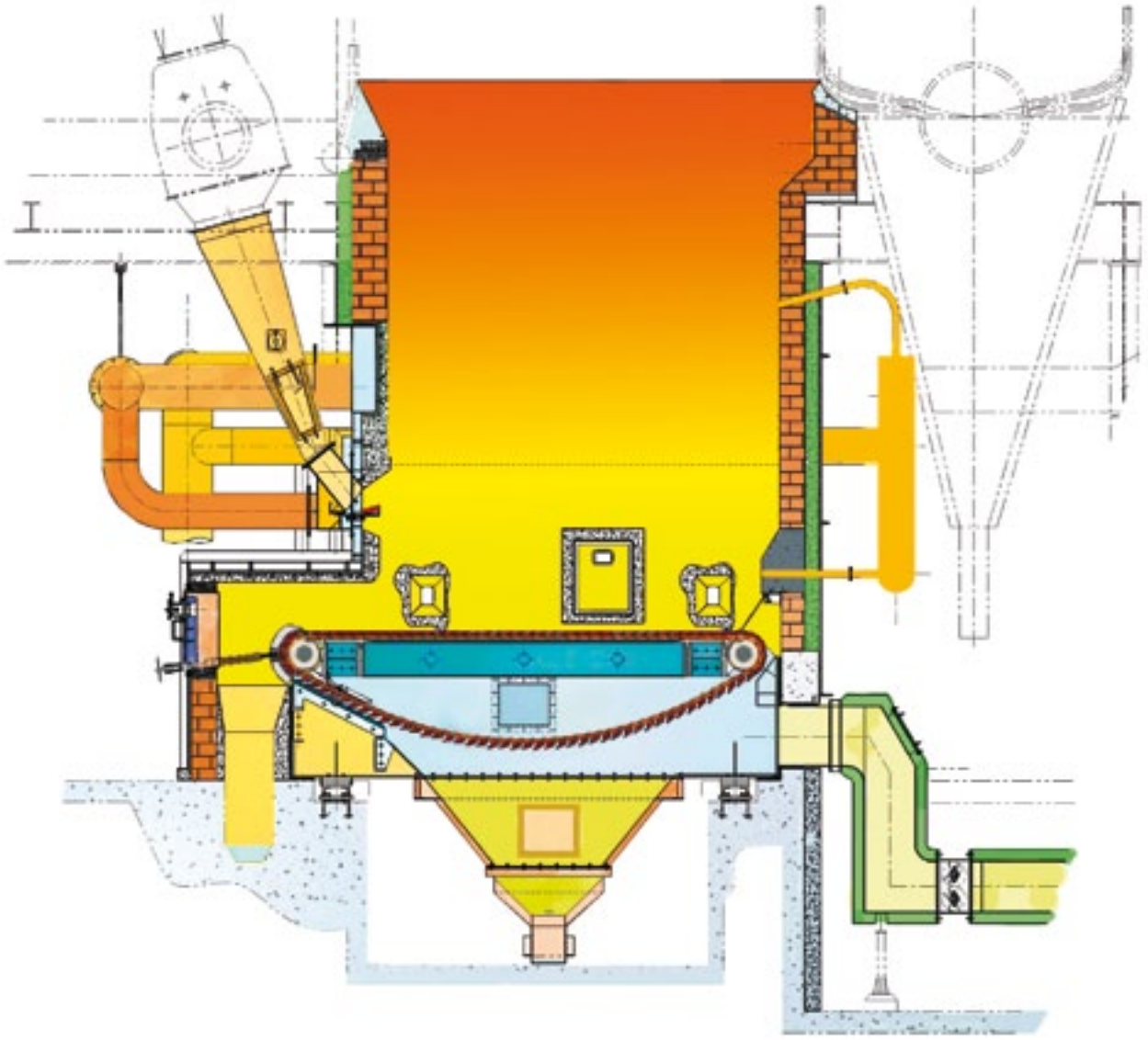

Features

- Catenary tensioned
- Continuous ash removal
- Self cleaning
- Variable speed drive
- Improved boiler availability
- Handles a wide range of fuels
- High combustion efficiency
- Low maintenance
- Uniform fuel and air distribution resulting in stable combustion

CASE STUDY No.38
Continuous Ash Discharge Stoker Retrofit on Two Boilers

John Thompson

ACTOM

JOHN THOMPSON
Continuous Ash Discharge Stoker Retrofit on Two Boilers

Background

In 2007, Illovo Sugar placed an order with John Thompson to supply, deliver and erect Continuous Ash Discharge (CAD) Stokers and ancillaries for their two Volund boilers at the Kilombero K2 Factory in Tanzania.

The Mill wished to overcome the problems associated with large quantities of sand being brought in with the cane and consequently in the bagasse.

Erratic load swings were encountered and the boilers were unable to maintain steam pressure when:

- The Horseshoe Furnaces were manually de-ashed, and
- The ash percent bagasse rose to very high levels particularly during the wet season.

Other modifications were carried out to the boilers to facilitate the installation of the CAD Stokers. These included the design, supply, delivery and installation of:

- Modified steel cased, refractory lined furnaces
- Pneumatic bagasse spreaders
- Spreader air fans and motors
- New secondary air nozzles
- Revised hot air ducting and dampers
- Hydraulic ash and grit sluicing
- Variable speed stoker drives integrated into the control system.

Plant and equipment was delivered from February 2008. Erection began in March/April and both boilers were commissioned in mid June.

Due to the combination of a short offcrop and the requirement for extensive civil works below the boilers, it was decided to assemble the stoker framework outside of the boiler support frames. This demanded revised methodology, developed by John Thompson, in which tracks were laid either side of each boiler, extending over the unfinished civil works below.

The main frames were supported on the tracks by a series of tracked crawlers. Upon completion, the frames were rolled in under the boilers and rigged onto pre prepared bearings.

The installation was erected under the supervision of John Thompson personnel with artisans from RSA and local labour. John Thompson personnel also supervised the commissioning.

Furnace

The original furnaces were of the self feeding type with suspended arches designed by Liptak Bradley.

The arches and attendant steelwork were entirely dismantled before the start of civil works to accommodate the coarse and riddlings hoppers.

The new furnace construction is of the parallel sided, refractory lined and steel cased type.

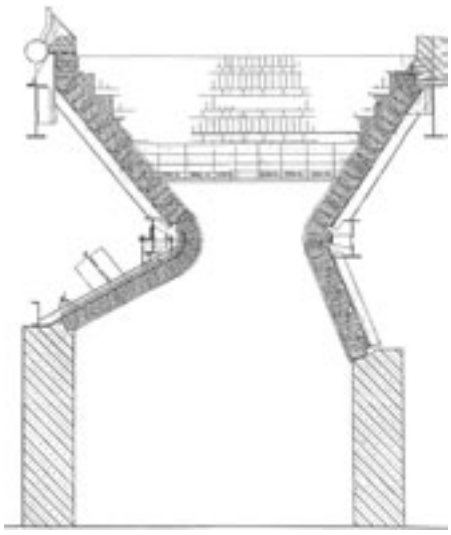

Figure 1: Original Suspended Arches.

The new frontwall casings, accommodating two new pneumatic bagasse spreaders, are air-cooled, utilising spreader air from the new Secondary Air Fan.

Two rows of secondary air nozzles were fitted to the rear furnace wall.

CAD Stoker

The stoker is of the conventional John Thompson type, discharging ash/sand at the front.

The stoker mats are driven by variable speed drives through planetary gearboxes with torque limiters and multi misalignment couplings. The stokers are catenary tensioned, eliminating the need for separate tensioning devices.

The mat consists of a series of several bands of grate bars attached to pairs of chains. The bars are manufactured from high grade cast iron, substantially ribbed to provide rigidity as well as a large surface area to maximize the cooling effects from the undergrate air. The chains are driven by toothed sprockets on the front shaft and pass over guide rollers at the rear. The grate bars run on a series of cast iron skid rails bolted on to the stoker frame.

Spring-loaded shoes prevent the grate from opening prematurely at the front, which would otherwise allow the entrapment of foreign material such as sand, stones, tramp metal and the like. The grate bars are designed to hang open on the return chain strand allowing ash and riddlings to fall freely into the hoppers.

The ash/sand mix is hydraulically sluiced into a holding pit between the boilers, from which it is pumped to a beach clarifier.

Riddlings are similarly sluiced into the holding pit for disposal.

Hot air is introduced into the rear of the stokers from the existing airheaters via revised hot air ducting and dampers.

Operation

The boilers were originally rated at 40 t/h but this evaporation was rarely achieved due to the de-ashing problems. Outputs below 50% of rated capacity were frequently experienced.

Manual de-ashing was also hazardous due to unstable combustion and associated puffing.

Subsequent to the retrofit, uninterrupted outputs of 40 t/h and above have been achieved without any manual intervention.

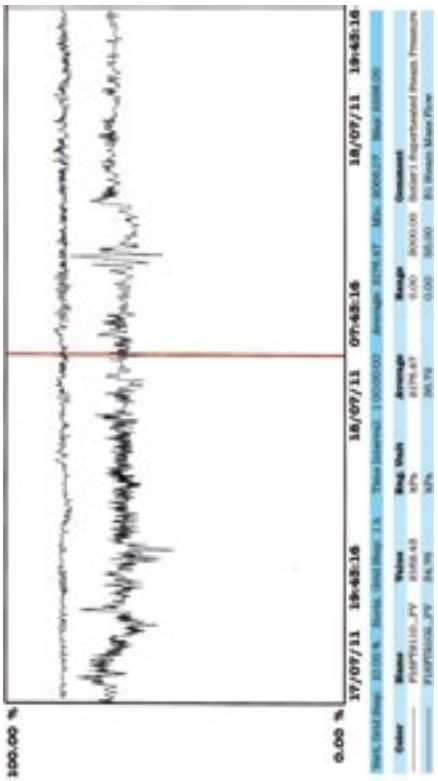

Figure 2: Steam Flow/Pressure Chart after Retrofit.

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