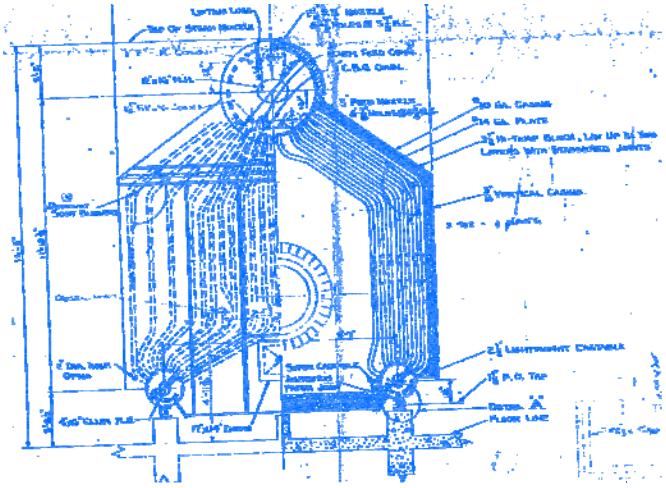
**APEX PIPING SYSTEMS, INC.**

**A Specialty Products Company**

# CASE HISTORY

**Project:** A Fortune 500 company operates several water-tube boilers at its laboratory in suburban Wilmington, DE. Boiler No. 3 is an A-Frame type boiler manufactured in 1961 by the Wickes Boiler Company of Saginaw, MI.



In March of 2007, the Company solicited bids from qualified contractors to begin a capital project to facilitate the partial re-tubing of the No. 3 Boiler along with the removal and reinstallation of new inner and outer casing and replacement of the boiler refractory and insulating firebrick.

As may be expected, the Company was also concerned that the completion of any phase of the project would be sufficient to meet the timing of the heating season. The Company also hoped to mitigate the possibility that it would have to procure the use of expensive temporary

**Scope of Work:** The subject boiler has been in continuous usage since the early 1960's and had only partially been re-tubed since its original installation over 40 years previous. Internal visual inspection and metallurgical analysis of the tubes had revealed localized materials loss and external corrosion and led to The Company's evaluation that some of the tubes had passed their useful life.

As a result, the Company initiated a capital project to replace over 500 of all of the bent boiler tubes, in addition to the other normal maintenance that would be expected in the course of the scope of work.

Tubing for the project was 2 in. O.D., 0.105 in. wall, SA-178A as per the original manufacturers design. The Company selected a contractor who met their requirements for Project Safety, was experienced in these types of industrial projects, but also had a long relationship with The Company in the areas of pipe & tube bending as well as completing many ASME code authorized projects for The Company. As part of the project, the important scope of tube bending would be kept in-house where the exact duplication of bend radii and tube angles could be controlled and the schedule would be maintained.

For the current scope, approximately 562 tubes needed to be replaced. The in-house bending of tubes was especially of benefit to The Company, considering the importance of the schedule to have the boiler back online prior to the heating season.

**Problem:** Upon entry into the boiler and the removal of several of the tubes, a visual examination revealed cracks in the base wall of the Mud Drum where the tubes were installed. The Company evaluated the abnormalities further and it was determined that complete replacement of the 18 in. diameter, approximate 25 ft. long drum was necessary. The drum which was ASME Code Stamped needed to be remanufactured exactly like the drum that was being replaced without the benefit of any previous used fabrication drawings.

As such the location of all 562 drilled holes in the mud drum would have to be as surveyed from the original drum which meant that the drum would first have to be removed from the boiler and transported to the contractors fabrication shop where the original piece would be available to confirm the size and exact location of the holes in the drum.

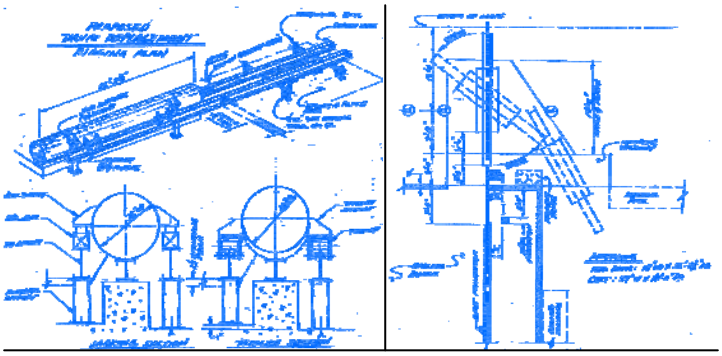
To further complicate the project, the location of the powerhouse was in a congested geographic area of the plant site with overhead power lines nearby that eliminated the possibility from removing the drum from the boiler by use of any crane.

The removal of the drum was also expected to be removed in a safe and cautious manner so that harm to workers or damage to the existing drum and other components and plant infrastructure would not occur. Whatever methods and procedures that were to be developed for the removal of the old drum would also be necessary to consider when planning for the re-installation of the new drum.

**Solution & Execution:** The Company, upon evaluation of the problem, requested from the Contractor, a procedure for the safe removal of the Mud Drum as well as well as how to complete the project in a timely manner and not negatively effect the sites need for steam and operation.

The Contractor immediately developed a written procedure that included a rigging plan that involved building a structural cart and trolley system to not only safely remove the old drum but allow for transport to the shop and subsequently to safely re-install the new drum.

Upon the approval of the Company, the Contractor constructed the cart and trolley and planned for the removal of the old drum. Simultaneous to the removal of the old drum, the Contractors shop operations immediately began procuring ASME code com-



pliant materials for the new drum and developed tooling that would be needed to facilitate the drilling of the 562 holes in the new drum.

Upon completion of the rigging plan and construction of the trolley, the contractor effected the safe removal of the existing Mud Drum. With the exception of ten tubes on the east and west end of the Mud Drum, all of the existing tubes were removed carefully and intact and transported back to the bending shop. As was previously part of the original project, all of the new tubes had to be bent to match an existing and corresponding bent assembly upon re-installation. After the trolley was rolled into place under the existing Mud Drum and secured, the remaining tubes were safely cut away from the Mud Drum and freed it to be rolled out of the boiler and building and to an awaiting truck to be shipped back to the fabrication shop.

Upon the safe delivery of the old Mud Drum to the fabrication shop, the Contractor immediately began the task of fabricating the new Mud Drum. To facilitate the drilling of the 562 holes, the 18 in. pipe for the new piece was placed onto a pipe pantograph which allowed the piece to circumferentially rotate. Then using carbon steel structural shapes and plate, the shop then built a drill press platform that would remain secure while drilling the laid out holes with a “Mag Drill”. The platform could then be moved along the total length of the new drum, and the piece easily rotated by the pantograph machine.

While the shop continued to drill the new holes and complete the fabrication of the new Mud Drum, the Contractor's bending shop began the forming operation of the new boiler tubes. The Contractor uses special hydraulic pipe and tube benders outfitted with tooling and boosters that minimize the amount of wall thinning and out-of-round.

While the shop continued to make the new Mud Drum and bend the new boiler tubes, the Contractor's field crew kept going with the other required maintenance and preparations for the new pieces. When the new Drum was ready it was placed onto the trolley and returned to the jobsite. The new Mud Drum was safely re-install and the trolley used to support the drum until enough new tubes had been installed to support the drum. By this time all of the new boiler tubes had been bent and the task of the re-installing the 562 tubes began.

In the course of installing the new tubes, replacement of the boiler refractory and insulating firebrick was also performed.

**Result:** The project was completed in advance of the heating season. The Company was very pleased with the execution and professionalism and cited the following three (3) factors that made the project a success; 1) The tremendous attention to Safety as the project was completed “accident-free”. 2) The Company found that the level of teamwork on the part of all of the various contractors, engineers and the Company's project personnel exceeded all expectations. 3) The project was completed with a high level of quality, both ahead of the original scheduled completion date, and under budget.

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