

# Induction Heat Tube Extraction for Generating Bank Re-Tubing

Over time, fireside tube wastage typically results in the need to replace generating bank tubes, including the stub ends rolled into the tube seats of the steam and mud drums. When it comes to generating bank re-tubing, rely on the proven Induction Heat Tube Extraction technology from The Babcock & Wilcox Company (B&W).

At B&W, we know that minimizing job cost and boiler downtime, as well as boiler drum shell preservation, are critical; you can't afford to take chances with tube stub removal.

B&W has developed two unique methods for removing tube stubs from tube sheets and drums. Both methods are based upon patented technology and employ the principle of induction heating to quickly and efficiently remove the tube stubs.

The processes are safe, clean and eliminate the risk of tube seat and ligament damage often caused by the traditional tube removal methods of carbon arc air gouging or acetylene flame cutting, reducing or eliminating the need for subsequent drum shell repairs.



*B&W's induction heat tube extraction processes reduce project cost and schedule, improve quality and reduce risk exposure.*

*continued* ▶

## *Innovative solutions*

Traditional methods of boiler generating bank tube removal are time consuming and highly labor intensive, create a poor work environment, demand extraordinary safety precautions, and carry significant risks to schedule, cost, and drum shell integrity. Traditional methods also depend heavily on specialized trade skills and may result in significant repair and rework to the drum seats.

Induction heating is a technique for heating metal by utilizing the interaction between current and magnetic flux. It permits the selective, rapid, concentrated, local heating of metal without contact.

Our Induction Heat Tube Extraction processes are entirely computer controlled, safe, simple, clean and effective in removing tube stub ends from boiler drums without damaging the tube seats.

The induction hardware consists of a high frequency power unit, an induction heating coil, an output-matching transformer, a remote on-off switch, interconnecting coaxial cables and cooling water hoses, and an auxiliary water cooling unit.



*Induction heating permits the selective, rapid, concentrated, local heating of metal without damaging the tube seat or affecting the surrounding material grain structure.*

## *Proven technology*

B&W's Heat and Pull and Heat and Shrink methods have been used to remove tube stubs in North American utility and industrial boilers since 2004.

The Heat and Pull method was developed for the removal of previously heavily over-expanded tube stubs from headers and drums. Hydraulic jacking from outside the drum takes place while the tube stubs are inductively heated from inside the drum. Prior bell removal is not required, as the bell collapses and is pulled through with the stub. This one-step process has become widely acceptable for removal of tube stubs from all drums with seating rings in the tube seats.



*Using induction heat, fumes, sparks, molten metal, and fire are no longer threats to safety and productivity and the ventilation requirements associated with these environments are eliminated.*

The Heat and Shrink method heats the generating bank tubes in situ to cause plastic deformation due to thermal expansion under restraint by the tube sheet (drum) followed by compressed air cooling. This results in the tube stub shrinking and breaking contact with the drum shell to provide for ease of removal. The loosened stubs are then removed by pounding with punch and hammer, either manually or with an air hammer.

## *Proven results and benefits*

### *Reduced project cost and schedule*

- Reduced man-hours through faster tube stub removal than by conventional methods
- Tube seat repairs are eliminated and the requirement for tube seat cleaning is reduced

### *Improved quality*

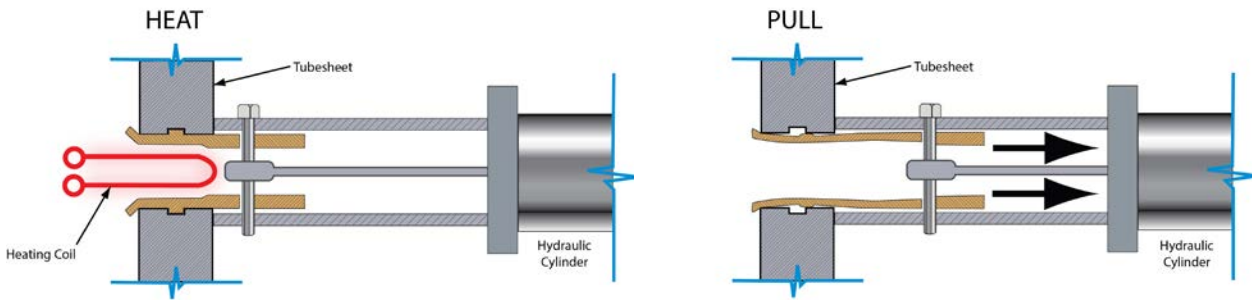
- Low heat input to the drum shell means that the material grain structure is unaffected
- No hardening of the tube seat surface and no risk of damage to the ligaments as proven by comprehensive metallurgical laboratory testing

### *Reduced risk exposure and enhanced safety*

- Tube stub removal does not require specialized skills
- Tube seat and ligament damage and consequent repair requirements are eliminated
- Fumes, sparks, molten metal, and fire are no longer threats to safety and productivity and the ventilation requirements associated with these environments are eliminated
- The technology is reliable, safe and effective

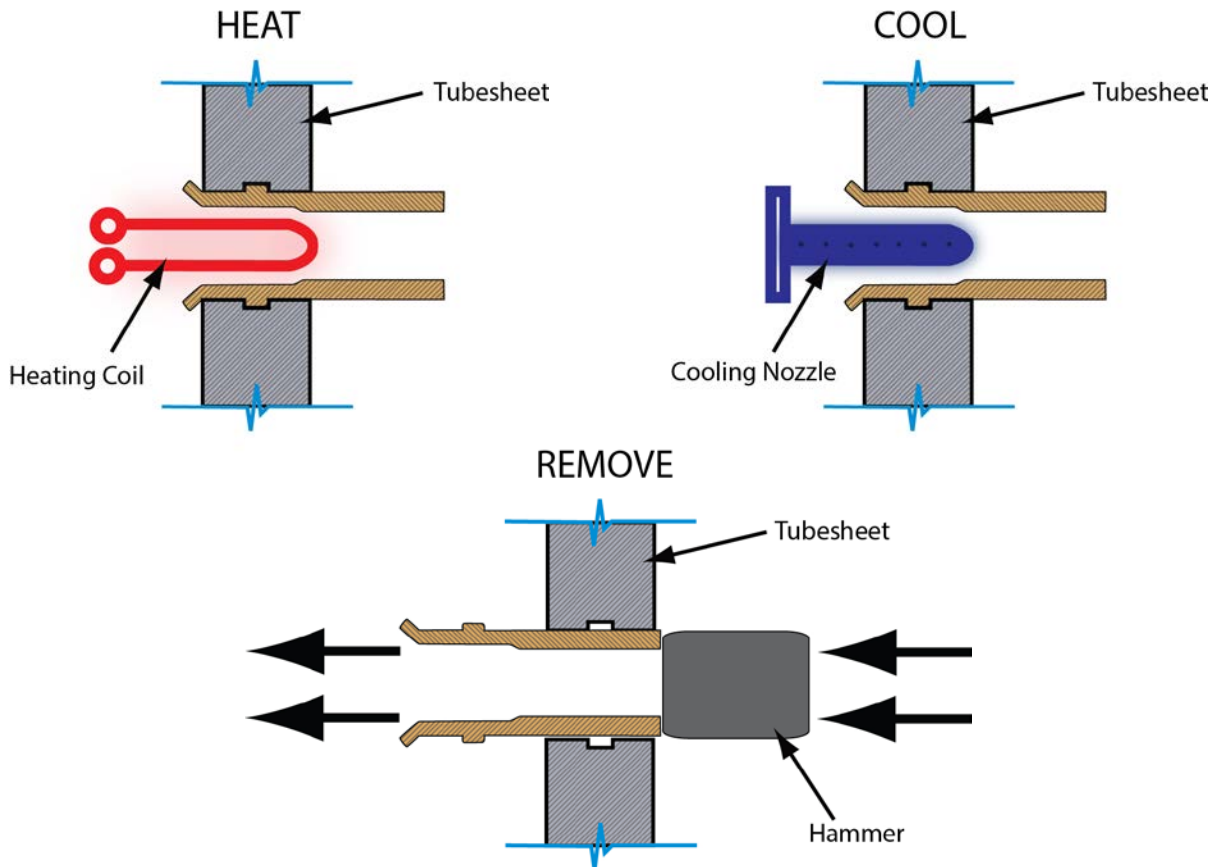
## Heat and pull

The Heat and Pull method rapidly heats the tube stubs in situ to 1000C, using a specially designed induction coil, which causes plastic deformation due to thermal expansion under restraint by the tube sheet (drum). The tube stub is extracted by hydraulic jacking from outside the drum while induction heating from inside the drum. The Heat and Pull method is particularly suited for the removal of heavily over-expanded tube stubs from headers and drums. Prior bell removal is not required, as the bell collapses and is pulled through with the stub.



## Heat and shrink

The Heat and Shrink method heats the tube stubs in situ to 1000C, using a specially designed induction coil, to cause plastic deformation due to thermal expansion under restraint by the tube sheet (drum). When cooled, such as by the application of compressed air to the tube, the tube shrinks, breaking contact with the drum and providing for ease of removal. The tube stub can then be easily driven out of the tube bore.



Both methods eliminate the need for conventional carbon arc or acetylene splitting of the tube stubs as well as the potential damage to the tube seats and subsequent repair requirements.

## Count on our breadth of experience

B&W offers a wide range of full-scope boiler and auxiliary equipment retrofits, upgrades, services and replacement parts to improve plant performance and efficiency and extend the life of your vital steam generating assets.

- Boiler performance and efficiency studies
- Comprehensive plant upgrade solutions
- Condition assessment
- Construction, startup and commissioning
- Conversions and fuel switching
- Engineering studies
- Field engineering services
- Inspection services Maintenance programs
- On-site training
- Plant operations and maintenance
- Plant performance and intelligent systems
- Pulverizer services
- Replacement parts inventory management
- Technical training seminars



*The patented induction heating technology has been proven on utility and industrial boilers throughout North America since 2004.*



**For more information, email us at:**  
**[IHTE@babcock.com](mailto:IHTE@babcock.com)**

### **Babcock & Wilcox**

20 South Van Buren Avenue  
Barberton, Ohio, U.S.A. 44203  
Phone: +1 330.753.4511

[www.babcock.com](http://www.babcock.com)     

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