WALLCOLMONOY
SURFACING ALLOYS

COLMONOYNEWS NOVEMBER 2012

Colmonoy® Surfacing Alloys Protecting the Boiler in Waste to Energy Plants

The rising cost of using landfill has encouraged more recycling of waste and has also led to greater use of incineration processes.

A new generation of Waste to Energy (WtE) and Biomass to Energy (BtE) installations are being built to produce electrical power from non-recyclable materials. This type of material produces harsh conditions within the incinerator / boiler which may significantly shorten the lifespan of key components.

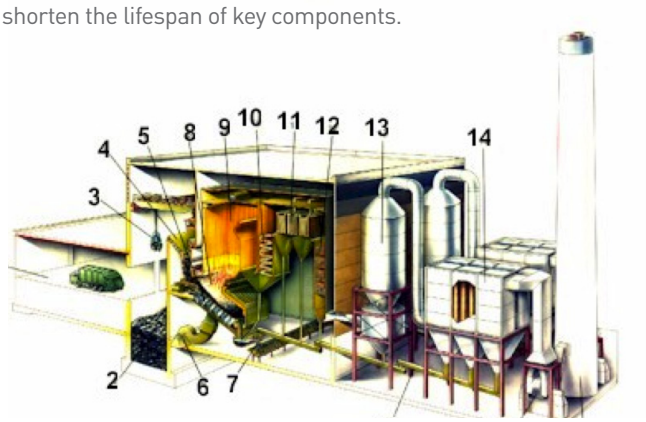

Figure 1: Schematic of a typical Waste to Energy facility.
#11 refers to the Super Heater.

High incineration temperatures, debris, ash particles and chemical constituents, such as chlorides, can cause erosive wear and corrosive attack within the boiler. Conditions and their consequent effects vary according to the type of installation and the products being burnt. In the worst cases, the lifetime of boiler walls, super heaters, economisers and other boiler components can be greatly reduced. Failure of such parts leads to outages and significant loss of revenue to Waste to Energy companies. Figure 1, a schematic of a typical Waste to Energy facility shows the areas where issues are likely to be seen.

Colmonoy Surfacing Alloys extend boilers useful life, minimizes downtime and improves efficiency

Colmonoy nickel-based Surfacing Alloys, manufactured by Wall Colmonoy, have been used successfully in both North America and Europe to combat erosive and corrosive attack in this type of environment. The range of alloys is ideally suited to protect against high temperature wear and corrosion.

COLMONOY® (nickel-based)	Nominal Composition - % by Weight								
	C	Cr	Si	Fe	B	W	Cu	Mo	Ni
4	0.4	10.0	2.3	2.5	2.2				Bal
5	0.5	13.8	3.4	4.0	2.3				Bal
6	0.6	14.0	4.2	4.0	3.0				Bal
69	0.5	16.5	5.1	3.0	3.5		2.0	3.0	Bal
88	0.6	15.0	4.0	3.5	3.0	15.5			Bal

Table 1: Colmonoy Surfacing Alloys for Waste to Energy

Wall Colmonoy offers many alloys of various chemical compositions and can also offer custom formulations

Application of these coatings by thermal spraying methods or welding techniques extends the boiler/incinerator's lifespan, minimizes downtime, and improves the efficiency of the system.

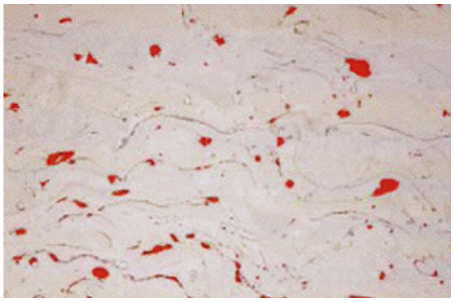

Figure 4: Cross-section through an Air Plasma Colmonoy coating on a super heater tube, porosity levels are < 3% (2)

Selecting the Right Coating to Protect The Boiler Component Surfaces

There are a number of factors that may influence alloy selection, these include:

a) The type of boiler
b) Specific conditions that exist within the boiler e.g. temperature
c) Location of the component within the boiler
d) The types of material being incinerated
e) The presence of erosive particles
f) Corrosive gases e.g. chlorine
g) Type of cleaning system used (e.g. soot blowers, water cannons)

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No two boilers have identical operating conditions; and therefore, it is important to understand the characteristics of the system and the type of waste being burnt. It is possible, and indeed likely, that a change in the type of waste burnt could significantly influence the issues seen within the boiler. For example, an increased proportion of plastics within the waste could lead to increased corrosion problems within the boiler. Figure 5 shows a super heater tube after 8000 hours service; the uncoated area has experienced significant material loss.

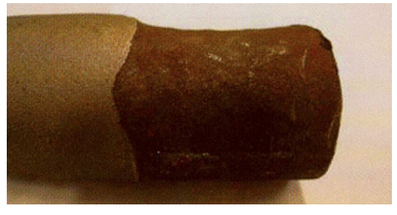

Figure 5: Super heater tube showing coated and uncoated areas after 8000h service (2)

The method of coating deposition may also dictate the alloy selected: typically coating materials are available as atomised powder or cored wire. Application of the coatings can be carried out using the Spraywelder™ System (Flamespray), Fusewelder® Torch (Powder Welding), HVOF, Wire spray, Air Plasma and Laser Cladding techniques.

Depending on the coating deposition method, the layer may require a subsequent heat treatment or fusing treatment. This increases the density of the coating and provides a smooth surface that minimises the tendency for build-up of deposits which reduce efficiency and heat transfer. Examples of coated boiler components are shown in Figure 2-3.

Figure 2: Colmonoy 88 Spray & Fuse overlay protecting Inconel tubes in core of Super heater boiler [4]

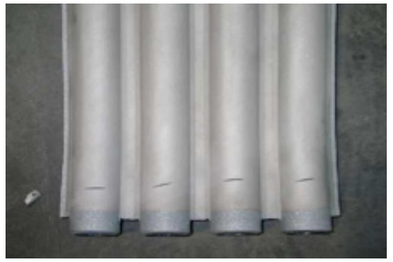

Figure 3: Colmonoy coated Super heater element for a WtE plant in the UK, coated boiler wall panel [2]

Application examples

North America

Colmonoy® 88 (3) has been used with great success on a range of boiler components. The alloy, which is deposited by thermal spraying methods, can outperform Inconel welded overlays particularly where erosion mechanisms are involved. Coating, if followed by a fusing process, may be carried out manually with a torch or in a furnace.

A unique combination of hard phases, dispersed within this patented alloy, provides excellent resistance to erosion, corrosion and abrasion within the boiler environment.

High temperature application of Colmonoy 88 provides strong metallurgical bonding and alloying with the base material. The coatings are uniform in their properties and can extend lifetimes well beyond those expected from uncoated material.

These coatings have been applied to a range of components from grate bars, through to super heater tubes and boiler walls (4). See Figure 6.

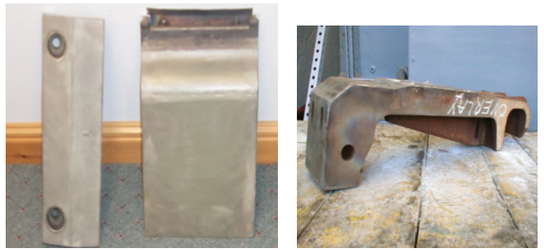

Figure 6: Colmonoy 88 coated side plates and grate bar casting

European Market

Colmonoy Surfacing Alloys are also used in the European market where atmosphere plasma spraying is gaining ground as the preferred technology for coating super heater and boiler wall components (2).

Coating can be carried out remotely on parts which are subsequently installed in the boiler or on-site within the boiler itself. Unlike the Spray and Fuse process, Air Plasma imparts very little heat into the tube itself; and therefore, the strength of the bond between coating and base material is not as great.

The bond strength is maximised through careful preparation of the surface to be coated and through control of the spraying parameters.

Typical coating thicknesses are 0.3-0.4mm (0.012-0.016") for boiler walls and 0.8-0.9mm (0.032-0.036") for super heater tubes.

The coating is applied automatically on straight tubes and manually around bends and other features. After coating, a special heat treatment is applied to the coating to help maximise bond strength. This process has no impact on the base material properties. A small amount of porosity (<3%) retained within the coating helps it flex and prevents cracking.

Conclusion

With the rising cost of using landfill, the recycling of waste has become more in demand – leading to a greater use of incineration processes. Harsh conditions exist within the incinerator – corroding and eroding the boiler tubes.

Modern thermal spraying techniques when coupled with Colmonoy® Surfacing Alloys provide an excellent solution to many of the wear and corrosive problems encountered in incinerators. The ability to tailor the alloy composition to meet the exacting demands of this environment is beneficial. Wall Colmonoy has extensive knowledge, experience and proven results with maximizing the lifespan of key components in WtE and boiler plants.

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3. US Patent No 5,141,571, Colmonoy 88
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About Wall Colmonoy

Wall Colmonoy is the leading manufacturer of alloy products for surfacing, high-temperature brazing and casting applications across a range of high-tech industries.

Known for our unique proven way of creating superior performing alloys that enhance engineered components, we pride ourselves on long-term strategic customer collaboration that produces value-added ideas and creative solutions.

Combining more than 70 years of engineering technology with a progressive, visionary outlook, Wall Colmonoy offers customers trusted, customized expertise that results in smart innovation and shared growth.

Progressive Collaboration for Superior Performance Worldwide.

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