

## Application**brief**

- Eclipse Product:** ThermJet Burner
- Submitted by:** Brad Neuliep, Greyhound Combustion (Houston, Texas)
- Application:** Submerged Heating of Acid Tanks
- Description:**

Zincubator LTD. of Houston, Texas designs and manufactures unique products for the Hot Dip Galvanizing industry. Two years ago the company saw the need for a more efficient, durable, and dependable way of heating the highly corrosive acid and zinc ammonium chloride process tanks used in the metal preparation process. That's when David Jaye of Zincubator contacted Brad Neuliep of Greyhound Combustion about recommending a burner that would be suitable for the application.

### **A NEW APPLICATION –**

The thermaflow heating system posed a new and challenging application which would utilize submerged combustion. Research shows that one of the most efficient means of heating the process tanks up to 160 Deg. F. is by using submerged combustion. Submerged combustion is the practice of heating liquids by bubbling a burner's hot combustion products through them, creating excellent heat transfer.

But firing a burner into a liquid bath is very difficult, given that the burner has to overcome the head pressure exerted by the liquid. The hot combustion gases have to exhaust far enough under the surface to allow sufficient distance and time for the heat to transfer into the liquid. The Thermaflow Heating System utilizes a proprietary design along with Eclipse ThermJet Burners to meet this challenge.

### **BREAKING THE MOLD WITH A BOLD, NEW APPROACH –**

Boilers have been used in the hot dip galvanizing industry for at least a hundred years, and are the most widely used method of heating process tanks. They are typically fired with natural gas, and transfer steam or hot water through pipes to heat exchangers submerged in the tanks to be heated. They are a reliable, time proven method of heating. The Thermaflow heating system also uses natural gas, and is submerged in the tanks to facilitate transfer of heat to the liquid baths as well. This is where the similarities end and the uniqueness of the Thermaflow heating system begins.

### **COMPARISON OF THERMAFLOW HEATING SYSTEM TO BOILERS AND HEAT EXCHANGERS -**

#### **Boiler :**

*Boilers* – Boilers and hot water heaters are like a separate operation located remotely in close proximity to the tanks to be heated. They require that the water be heated in a furnace and then transferred through pipes to the process tanks. Energy losses begin at the boiler, continue through the piping to the tanks, ending with the heat transfer through the coils submerged in the process liquid. Even though many boilers manufactured in recent years may have efficiencies up to 80%, by the time the heated water gets to the tank, it has dropped to below 60%. Older systems can be even less efficient.

*Thermaflow heaters* - The Thermaflow Heating System is located directly in the process tank. There is no separate furnace, no piping of water/steam, and no heat exchangers. The Thermaflow Heater utilizes a proprietary design (there is a patent pending) which uses submerged combustion as the way of transferring heat to the liquid in the tank. This is accomplished by attaching a burner to the end of a machined carbon tube and firing directly under the surface of the liquid, allowing the gases to completely burn and then exhaust directly into the liquid. The air/gas ratio is adjusted to precise levels based on empirical data on the burner and the BTU output desired for that particular heater. A specially designed housing is designed in such a way as to promote a suction from the bottom which causes a flow of liquid to travel up through the heater and out an opening in the top. This flow allows the Thermaflow heater to direct and mix the exhausting gases to achieve maximum thermal efficiency. Over 90% of the available heat goes directly into the liquid!

**Heat exchanger :**

*Boilers* – Most boilers and hot water systems use heat exchangers in the process tanks. There are several types available, but all seem to have limited life expectancy due to the corrosiveness found in the process. Elevated levels of chlorides and other impurities can cause rapid failure in some systems.

*Thermaflow heaters* – Thermaflow heaters are constructed of graphite and thermal plastics in the submerged portion of the heater. Since both products are inert to the corrosive chemicals, there has been little to no evidence of wear with heaters in over 18 months of service.

**Boiler monitoring :**

*Boilers* – Most localities require that boilers over a certain psi or horsepower have 24 hour monitoring which requires that personnel always be present or on call. This is just another source of permitting and paperwork to be maintained and then scrutinized by authorities.

*Thermaflow heaters* – Thermaflow heaters do not require any type of special boiler permits or monitoring.

**Chemicals and maintenance :**

*Boilers* – Boilers require special additives to be injected into the feed water to help prevent buildup of scale inside the boiler tubes and piping. Annual inspections are usually required for permitting purposes, requiring scheduled shutdown of the system.

*Thermaflow heaters* – Because the process liquid is directly heated, the need for chemical additives does not exist. There are no annual inspections.

**The Eclipse solution :**

The Eclipse ThermJet burner has proven to be ideal for the Thermaflow heating system. Its unique design allows for exact measurement of both air and gas flows through orifice plates located directly on the burner. The burner's capability of a wide turndown range with high excess air is also a plus. Other Eclipse products used in the system include flame safeguards, combustion air blower and both electric and manual valves.



*Overall View of Thermaflow Heating System*