

Application Report

AR-150

SRS Wintergreen chooses Eclipse ThermJet Burners for uniform temperatures with low NOx in post-weld heat treating furnace

SRS Wintergreen (SRSW) is a global supplier of high quality hydrocarbon and chemical processing equipment. Founded in 1986, the company provides mechanical engineering design and fabrication of pressure vessels, flare stacks, incinerator

Guard specifications. SRSW is one of a limited number of companies authorized to use ASME Code U, U2 and R Stamps.

In accordance with the ASME code, much of the equipment fabricated by SRSW is required to be post-weld heat treated. Initially, the company subcontracted this work out. In time, however, the outsourced work reached an annual cost level of a quarter of a million dollars. At that point, SRSW management made the decision to build an in-house heat-treat furnace. This investment would reduce heat treating to a fraction of the subcontracted cost and virtually eliminate the labor and transportation costs associated with getting the equipment out and back. In addition, it would save valuable completion time to improve customer service, and also allow SRSW to subcontract its own heat treating services to others.



Designed for post-weld heat treating of large and heavy parts, SRS Wintergreen's new furnace incorporates 24 Eclipse ThermJet high-velocity, low NOx burners and Veriflame programmable burner monitoring system.

stacks, tray towers, columns, reactors, drums and process equipment modules designed for use in critical applications in refineries, petrochemical companies and chemical processing plants.

SRSW's products are fabricated at locations in Tomball, Texas and the Port of Houston to meet the most stringent ASME, ANSI and U.S. Coast

Furnace Design and Construction

The SRSW post-weld heat treating furnace, heated by natural gas, was designed and built by an in-house team with the assistance of Brad Neuliep from Eclipse Combustion's Houston sales office. The design team selected an "in-and-out" box furnace design as the most practical solution for handling bulky and heavy parts. This design is referred to as a car-bottom furnace because it is

loaded by a track-mounted car which, when rolled into the furnace, forms the bottom of the heating chamber.

The furnace dimensions are 22 feet high by 25 feet wide by 60 feet long. According to Dr. Jerry Icenhower, SRSW Professional Engineer involved in the furnace design process, "After careful consideration of marketplace options, we decided to use Eclipse ThermJet burners in the furnace.



For heavy, bulky parts, this "in-and-out," car-bottom design is a practical solution. Parts are loaded on a track-mounted car which is rolled into the furnace to form the bottom of the heating chamber. The furnace is 22 feet high by 25 feet wide by 60 feet long. Stress relieving is typically done at temperatures that range from 1050 to 2000 degrees F (566 to 659 degrees C), depending on the material and its chemistry.

Factoring into our decision was the need for extremely reliable, high-velocity burners as well as low NOx emissions. Uniform heat treating is absolutely vital to the quality and reliability of the equipment we produce."

Process Challenges

SRSW fabricates its mission-critical pressure vessels and processing equipment in a wide variety of materials, including carbon and stainless steel (all grades), nickel alloys, Hastelloy, Monel, Incoloy and more. As might be expected, much of the equipment they fabricate is sizeable. The company can produce

pressure vessels with wall thickness of up to eight inches, 200 feet in length, 20 feet in diameter – and weighing up to 500,000 pounds.

Once the SRSW Engineering Department prepares the fabrication drawings from customer specifications and drawings using a state-of-the-art CAD system, fabrication work begins. After welding, there are a number of heat treatments that can be specified (e.g. annealing, normalizing, drawing and fusing), but stress relieving is the most commonly used. Of major importance to weldments, stress relieving is typically done at temperatures that range from 1050 to 2000 degrees F (566 to 659 degrees C), depending on the material and its chemistry.

Stress relieving is a heat treating process in which residual stresses in welded parts are lowered or decreased in intensity. Where parts being welded are fixed too firmly to permit movement, or are not heated uniformly during the welding operation, stresses are developed due to the shrinking of the weld metal at the joint. Parts that cannot move to accommodate expansion and contraction must be heated uniformly during welding and stress relieved after the weld is completed.

These precautions are particularly important in welding aluminum, cast iron, high carbon and other brittle or "hot short" metals (i.e. metals having low strength at temperatures immediately below the melting point). Ductile materials such as bronze, brass, copper and mild steel yield or stretch while in the plastic, or soft, conditions and thus are less liable to crack. However, they may retain undesirable stresses which tend to weaken the finished weld.

The ThermJet Solution

Stress relieving heat treatment is best performed in a controlled atmosphere or air furnace such as the new custom-designed furnace at SRSW. A high rate of forced recirculation is commonly employed to obtain and maintain efficient heating rates and uniform temperatures throughout the furnace.

Eclipse ThermJet burners provided the ideal solution. Their unique design allows a wide turndown range with high excess air, and their high velocity flame (up to 640 mph) provides superior efficiency and temperature uniformity throughout the furnace. In addition, with ThermJet burners, NOx emissions typically measure less than 30 ppm. SRSW's car-bottom furnace incorporates 24 Eclipse ThermJet Burners and state-of-the-art Veriflame programmable monitoring and control system which allows operators to program the burner controls to accommodate specific materials.

Smooth Installation, Reliable Performance

According to William Hoffart, SRSW plant superintendent, "Everyone was surprised at how smoothly the startup and certification of the furnace went. To be honest, we did not expect the initial phase to be quite so trouble-free."

By the time the furnace was up and running full-time, SRSW had a backlog of equipment and components to be post-weld heat treated and work began in earnest. During the first few weeks, as many as four pressure vessels a week were heat treated. Once the in-house work was caught up, SRS Wintergreen began offering

post-weld heat treating services to other metal fabricators, at competitive pricing and with the promise of fast turnaround.

Of this additional benefit, Dr. Icenhower notes: "Without a doubt, the new furnace has been a successful investment for us. Currently, we are able to heat treat all of our own equipment requiring post-weld stress relieving. And, in addition to saving on outsourcing costs, we are actually turning a profit by offering post-weld heat treating to other ASME Code fabricators."



Effective post-weld heat treating for stress relief plays a crucial role in the quality and reliability of SRS Wintergreen's processing equipment. For the new car-bottom furnace, the company selected Eclipse ThermJet burners to provide efficient, uniform and environmentally superior process heating.

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