RMU-CARES Project Report

AUTOMATING THE FLAME HARDENING PROCESS

CHALLENGE

Penna Flame Industries of Zelienople, Pa., incorporated in 1968, has emerged as one of the best "flame hardening" and "roll manufacturing" enterprises of its kind in the United States today. In addition to flame hardening and roll manufacturing, Penna Flame offers services in cryogenics, tempering, stress relief, straightening and metallurgical testing, with quality of service being the top priorities.

Penna Flame Industries used to perform, control and monitor heat treatment processes manually, which was very labor intensive. The company contracted with RMU-CARES to automate the process, make it more technologically advanced and cost effective, and at the same time, improve efficiency.

PROJECT

RMU-CARES conducted research on diverse industrial robots, examining their configurations and compatibility with the equipment and environment at Penna Flame Industries, and selected FANUC 16iB (reach = 1885mm; repeatability = +/- 0.08mm; load = 20kg), which is highly reliable and suitable for the application of flame hardening and heat treatment processes.

RMU-CARES designed a robotic work cell that includes an aluminum top table, grippers, fixtures, safety light curtains and flame torch. The torch design includes the homogenous mixer of two gases to produce flame to heat the ferrous material at a very high temperature of about 2000 C. The table was designed to maximize the work envelope with a provision for quenching solution to be recovered after cooling the heated surface.

A program was written for the robot movements, and the robot functionality was tested in RMU laboratories. After testing was completed, the cell was shipped to Penna Flame and installed at their facilities.

TIMELINE

September 2007–April 2008

PROJECT FUNDING

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PARTICIPANTS

Penna Flame Industries and RMU-CARES.

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