

Blast Cleaning Steam Turbine Diaphragms



MARKET

Power Generation

APPLICATION

Refurbishing steam turbine diaphragms using abrasive blast cleaning

THE CHALLENGE

A major supplier to the power generation industry wanted to automate the refurbishing of steam turbine diaphragms using abrasive blast cleaning. The existing process of manually blasting the diaphragms with a worker in a blast booth was labor intensive and time consuming. Part size and configuration would make automation difficult, however, as the diaphragms ranged in size from 4" to 90" in diameter and each part had many different faces. In addition, the parts had already been in service and extreme care was needed to ensure that the proper amount of material was removed. Each surface required a precise amount of blasting to bring it back to original specifications. An even bigger challenge was the fact that parametric programming would be required to segment the blast areas; however, 3-D CAD models of the parts did not exist.

THE SOLUTION

The power generation supplier was an Empire customer that was using an Empire blast system to process newly manufactured parts. Based on the success of this system, they

turned to Empire for a solution to blast cleaning the steam turbine diaphragms. After careful analysis of the problem, Empire devised a solution and was also able to demonstrate to the customer how the system would work.

To automate the process, Empire provided two custom engineered automatic robotic blast cleaning systems featuring invert-mounted robots. Empire recommended the proper size and orientation of robots that would get the job done efficiently and meet the required quality standards. In order to allow for parametric programming and segmenting of the blast areas, Empire worked closely with Robot Master who developed a custom software program which would enable the supplier to create 3-D CAD models of the diaphragms.

Utilizing the industrial PC supplied with the blast system, the software program features the ability to enter up to 29 different dimensional parameters in a spreadsheet format and then programmatically generate a 3-D CAD model. This model can then be viewed on screen to make sure that it matches the physical part.

After confirming that the 3-D model matches the diaphragm, a robotic tool path simulation executes with exact robotic blast sequence. It can be viewed on screen for quality control purposes prior to actual processing. The software also offers the ability to upload the program from the industrial PC to the blast unit's robot controller via File Transfer Protocol (FTP) versus the traditional method of using a USB card. FTP is faster and more reliable.

The robot controller also utilizes a Robot Master software package that gives precise segmenting of the blast areas. A key feature of the software is the ability to programmatically select whether each surface of the part will be processed simultaneously or, if needed, selected individually. This selective feature allowed critical areas to be easily reprocessed, eliminating time-consuming manual touch-up.

BENEFITS

Empire's solution enabled the supplier to improve quality and lower costs by replacing a worker in a blast booth with an automated blast cleaning system. Manually blast cleaning a single diaphragm took four to five hours. The Empire system cleans a diaphragm in as little as 45 minutes, resulting in significant savings in time and labor. ●