

## High-Accuracy Field Machining

# Innovative Fix Keeps Basin Pump's Pipe Sections "On the Level" at Nuclear Plant



### The Client's Critical Issue

Engineers at the Vogtle nuclear power plant in Burke County, Georgia were constantly chasing a high level of vibration within the reactors' cooling pump system. Water courses through the pump vertically at some 100,600 gallons per minute. The pump's impeller shaft spins at approximately 2,000 rpm.

Eighteen sole plates create a mounting surface for the huge centrifugal vertical pump. In the past, the plant's technicians had inserted shims, sized to match the plates' upper and lower surface areas, to make up for any difference in each of the plates' levelness. But this was an imperfect solution.

If a shim moved even slightly when a pipe section was put back into place on top of it, the shim's effectiveness in leveling the plates would be lost. Plus, the shims, even when placed just right, could wear over time. With the energy from the shaft's rotation, full bearing plate contact must be ensured. The plant's project manager sought a more reliably accurate method.



**At the plant's cooling tower, Dimensional Engineering validated or recalibrated 18 sole plates that create a flange for securing the basin pump.**



“This is surely the first time a repair task like this has been attempted and accomplished at a nuclear facility.”

### The Dimensional Engineering Solution

Dimensional Engineering, under contract to the nuclear plant's field engineering supplier, applied its expertise in laser scanning and tracking to take precise digital measurements of the bearing plates. The measurements revealed that the adjoining flanges, when originally installed, were off by 0.28 inches in parallelism to the world – an extreme amount considering that the impeller's shaft is about 30 feet in length. This, it was determined, could be the primary reason for the wear on the upper and lower bearings.

The cause of high vibration was now in sight. The laser tracker accounted for the plates' angularity to the world's gravitational plane. Measurements determined the lowest level of the plates; this would serve as the benchmark for ensuring their evenness.

Next step: making needed adjustments. The field engineers mounted a milling machine to a steel beam spanning the pump's 18 foot opening. The machine was then lowered between the bolts used for mounting the upper end of the pump.

Dimensional Engineering was tasked with controlling the machining process. With each move and re-alignment of the milling machine, plates were re-measured to determine their flatness and parallelism, as well as the amount of material to be removed from them. This was the critical phase of the project; it allowed for the high degree of accuracy required.

### The Value We Provided

Dimensional Engineering provided the technology and expertise for maintaining an incredibly tight tolerance. All plates were certified to within 0.005 of an inch.

“History was made,” said the plant's project manager. “This is surely the first time a repair task like this has been attempted and accomplished at one of our nuclear facilities. We now have the assurance of a properly performing basin pump.”

Following up three months after the repair project's start, the pump is running better than it ever has – with minimal vibration.



**Each sole plate was machined parallel to the Earth's surface and to an elevation within 0.005 of an inch of each plate. It was a level of tolerance that pushed the limits of field machining.**



**Using a laser tracker, Dimensional Engineering created a world plane and a datum alignment coordinate system. The model accounted for thermal expansion.**



**A beam-mounted milling machine was painstakingly repositioned for each sole plate. Result: validation or recalibration for all plates, well within the required tolerance.**



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