

MACHINE TOOL COOLANT

Quick

STUDY

Hydra-Cell
Seal-less Pumps

www.Hydra-Cell.com

Location:	United Kingdom
Application:	EDM hole drilling
Media:	• Deionized water
Model No.:	D04
Flow Rate:	Variable to maintain constant pressure and serve different machines
Pressure:	
Hydra-Cell Advantages:	• Seal-less design • Low pulsation • Proven compatibility with harsh non-lubricating fluids such as DI water



EDM Machining of Turbine Blades for Aero Engines

One of the world’s leading aero engine builders transformed the efficiency of EDM hole drilling operations in the manufacture of turbine blades by switching to a system based on Hydra-Cell D04 pumps to deliver consistent flows of dielectric fluid at high pressure. The new system reduced production downtime, cut pump repair costs and provided a quieter working environment.

The intricate narrow-bore cooling channels in turbine blades are produced by EDM drilling - a precise spark erosion technique used here to create holes of less than 1.4mm diameter, ranging down to 0.3mm. An essential element of the process is the Deionized (DI) water dielectric fluid that is pumped through the hollow electrode wire and flushes out debris from the hole, ensuring an uninterrupted machining cycle. This prevents damage to the recast layer in the work piece and avoids enlarging the hole outside of tolerance.

For process conformity, flushing liquid must be delivered to the tools at constant flow and pressure. The pumping system must also operate reliably in serving a variety of machines with flow requirements ranging from 0.26 to 1.06 gpm. The single-acting diaphragm pumps installed with the original machines proved inadequate to the task.

Among the problems experienced were heavy pulsation, surges in pressure and a high wear rate. DI water is not easy to pump and destroys most pumps that incorporate a mechanical seal - consequently there were frequent breakdowns. Air consumption was an added cost, and the pumps were noisy.

A six-month trial, in which the D04 ran 24/7 with no problems, led to the installation of more than twenty Hydra-Cell units with controls and interfaces designed by the Hydra-Cell distributor. Each pump served three machines and was speed controlled to give precise flows needed to maintain pressure constant within $\pm 1.25\%$ of the specified level.

A review five years after the progressive conversion to Hydra-Cell technology revealed no pump failures and confirmed elimination of problems of pulsation and pressure surges. Consequently, run-time guarantees were met and fewer rejects recorded - at this stage of its manufacture, each scrapped blade represented a cost of \$5,600. Pump repair costs, which had totaled nearly \$500,000 before the changeover, were negligible.

Hydra-Cell has subsequently been applied on other applications in the plant, including grinding wheel cleaning via a high-pressure stream of liquid.

Characteristics of Fluid Pumped:

- ☒ Contains Abrasives
- ☒ Corrosive
- ☒ Solids in Suspension
- ☐ High-temp. (>158°F/70°C)
- ☒ Non-lubricating
- ☐ High-viscosity (>500 cPs)