

## CASE STUDY

# MANAGING THE EFFECTS OF HEATING ON JET ENGINE BLADES USING A VACUUM SYSTEM

## PROJECT OVERVIEW

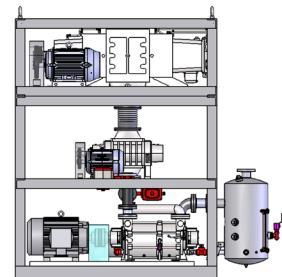
AVS needs a flexible and reliable vacuum system to tackle the demands of handling low PH Chlorine gas mixed with high PH water for jet engine blade coating application. Since jet engine blades are subjected to extreme heat during operation, AVS requires a vacuum system that not only improves the coating strength of the jet engine blades metal, but also requires a coating to stand up to severe oxidation and corrosion problems to lengthen the life of the jet engine blades. This helps the end user reduce maintenance costs, downtime, and aftermarket costs.

## ABOUT ADVANCED VACUUM SYSTEMS (AVS, INC.)

Based in Ayer, Massachusetts, Advanced Vacuum Systems (AVS) is a privately held, original equipment manufacturer of custom vacuum and pressure furnaces. Integrated with capabilities in concept, manufacturing, assembly, and technical support, AVS focuses on delivering a complete furnace solution tailored to the needs of their customers. AVS serves the aerospace, automotive, energy, and other industries worldwide that require treated metals in their applications.

## SOLUTION

Kinney® currently supplies a wide variety of vacuum pumps, boosters, and vacuum systems for AVS furnaces and was a natural partnership for this project. Rooted in a long history of innovation and manufacturing experience, Kinney maintains the industry knowledge and wide product line offerings to be able to apply the right product for each specific application needed by AVS.



*Vacuum System:  
MB7300/MB1602/AERC525 FSR  
(Full Sealant Recovery)*

In 2014, Kinney began a Research and Development (R&D) initiative with AVS that required an integrated vacuum system for testing various jet engine blade coatings. This custom system required tailored specifications that allowed it capable of handling high gas flows at ~ 1-2 torr as well as low PH gases. For this phase of the project, Kinney's 400/AE/KLRC75 (booster/ejector/SS KLRC) vacuum system was recommended because of its capability to operate the system on water, the stainless steel liquid ring pump and recovery system, and the VFD on the booster which all help balance the PH. By adding Sodium Hydroxide to the water, AVS was able to allow the low PH Chlorine gas to mix with the high PH water to achieve their desired results.

The small-scale system was developed and expanded into a larger scale project in 2015, with shipment to AVS and the customer site completed in 2016. While the initial system was used as an R&D initiative, the larger scale system has been expanded into production capabilities. Production required a more robust vacuum system and the 7300/1602/AE/KLRC525 (booster/booster/air ejector/SS KLRC) system was used due to the demand to handle significantly higher gas flows while still allowing the system to operate within a wide pressure range. Furthermore, the learnings from the R&D initiative lead to including lower RPM boosters, a PH monitoring system, a by-pass around the vacuum booster, Kalrez seal elastomers, and more which improved production capabilities.