SULZER

Sulzer Turbo Services

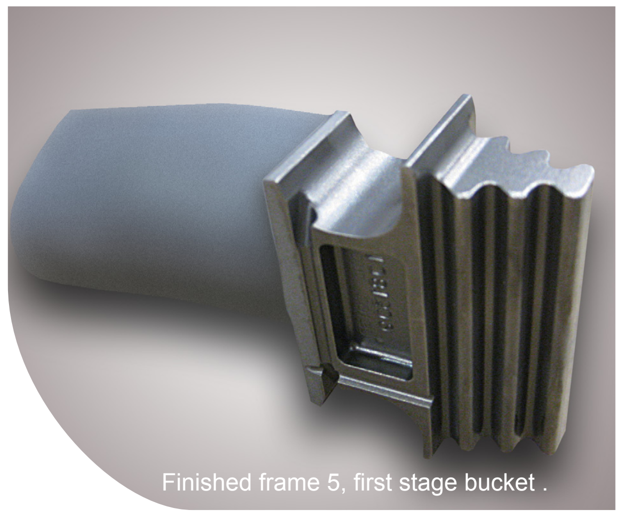
H16
MCrAlY's - Oxidation and Corrosion Resistant Coatings

Gas turbine section components are made of nickel or cobalt based superalloys. These superalloys are well known for their high temperature strength, oxidation, and corrosion resistance. Superalloys are widely used for high temperature environments of gas turbine engines. Unfortunately, alloy compositions required for high temperature strength run contrary to those for oxidation and corrosion protection. To obtain the best overall performance, high strength superalloys can be coated with a corrosion and oxidation resistant MCrAlY. MCrAlY's are a family of superalloys which have a base metal (M) of cobalt, nickel or iron, combined with chromium, aluminum and yttrium, as shown in Figure 1.

Element	Weight %
Cobalt	Balance
Nickel	32
Chromium	21
Aluminum	8
Yttrium	0.5

Figure 1: H16 Chemistry

MCrAlY coatings may be utilized on both stationary and rotating components in the hot section of gas turbine engines. Examples of parts which benefit from MCrAlY coatings include turbine blades, vane segments, and shroud blocks. MCrAlY coatings can also be used as protective bond coats for yttria stabilized zirconia thermal barrier coatings. Coating thickness typically measures 5-10 mils, but can be applied in excess of 25 mils.



Finished frame 5, first stage bucket .

Sulzer Turbo Services Houston offers H16, a CoNiCrAlY designed primarily for high temperature corrosion resistance. H16 also offers protection from high temperature oxidation and is applied using a High Velocity Oxy-Fueled (HVOF) gun. The HVOF process produces dense coatings with low oxide content and high bond strength. HVOF also results in a smooth surface finish. Figure 2 shows a 200X cross sectional photomicrograph of H16.

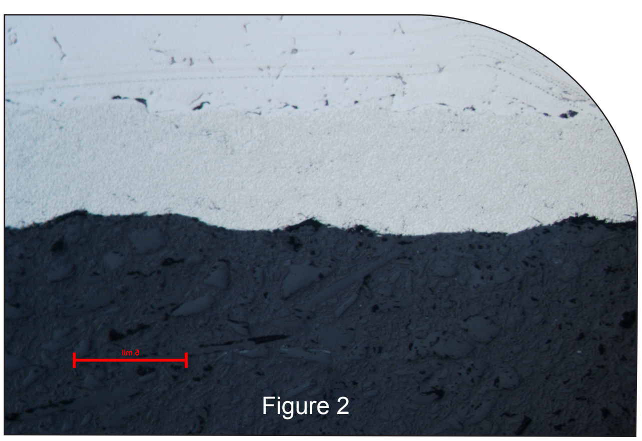


Figure 2

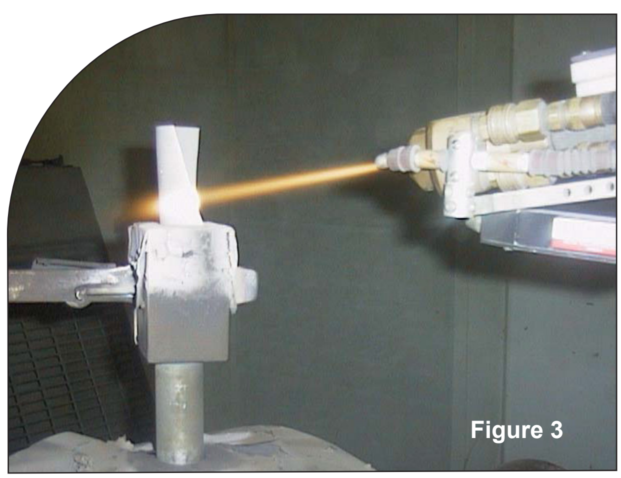


Figure 3

Porosity and oxide content of STSH H16 is less than 3% in combination. Coating roughness typically measures between 15-300 microinches Ra (.100 cutoff) before possible post-coating processing to improve finish. The bond strength of HICoat H16 is greater than 10,000 psi (ASTM C633).

STSH couples an 8-axis robotic manipulator along with closed loop automated HVOF spray equipment to apply H16. Robotics and automation offer the advantage of coating uniformity and reproducibility by removing the human error associated with hand spraying. Figure 3 shows a GE F5 Row 1 turbine blade being coated at the STSH facility. After coating has been applied, the parts are heat treated in a vacuum furnace. The purpose of this heat treatment is to form a diffusion layer between the coating and the part, which increases bond strength and minimizes opportunity for coating spallation.

Since STSH is an ISO9001 certified coating facility, the quality and reproducibility of H16 are constantly monitored through a vigorous quality assurance process. H16 is applied in accordance with STSH application specification G-CMS.017, and meets the design criteria as outlined in coating standard G-CS-S.017.

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