Metal Seal Platings, Coatings and Finishes
TriCom®

TriCom is a proprietary electrodeposited composite tribological coating developed to provide excellent wear and oxidation protection for metallic sealing systems. TriCom comprises a unique matrix of cobalt co-deposited with chromium carbide (Cr_3C_2) particles to create a wear and oxidation resistant system for prolonged use at 1150°F and limited use at 1250°F.

TriCom is designed to significantly reduce the wear of metallic sealing elements and the respective mating surfaces caused by thermal expansion and vibrational movement.

The unique wear characteristics, excellent bond strength, and ease of application of TriCom make it an excellent candidate for application on thin flexible sealing members. These characteristics provide TriCom a competitive advantage when compared with other coating alternatives. Bond strength testing has been performed to show that TriCom will continue to adhere to a seal under bending loads that would cause a comparable thermal sprayed coating to spall.

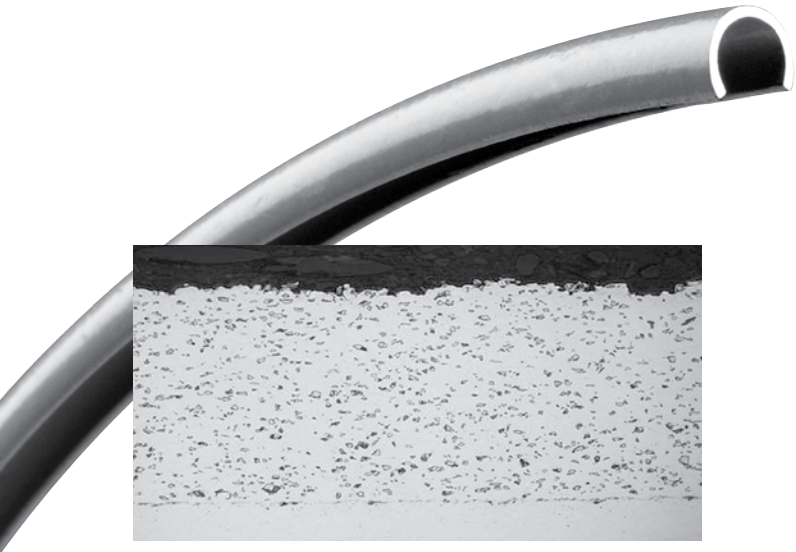

Figure 1: TriCom is a composite coating consisting of a cobalt matrix with chromium-carbide reinforcing phase.

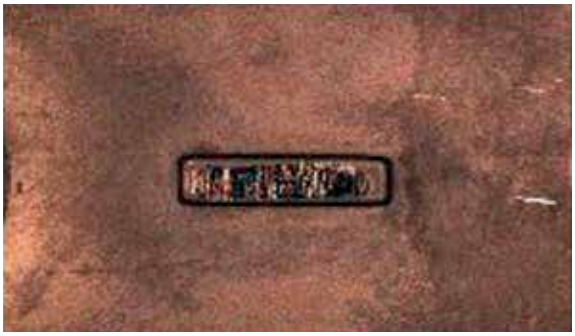

Figure 2: Pin on Flat Wear Test Results for Alloy 718 Coated with TriCom and Tribaloy T-800.

Table 1 – TriCom Characteristics	
Hardness (as-coated)	300-350 HVN 29 - 35 HRC
As-Coated Surface Finish	32 µin Ra or better
Coating Thickness	As specified (.001 to .005 in. typical)
Service Temperature	1250° F (621° C) Max.

Coating Structure:
TriCom is a composite coating containing finely dispersed chromium carbide particles (Figure 1). Cobalt in the coating matrix provides high temperature lubricity. Chromium carbide reduces the wear rate by acting as a solid lubricant when partially oxidized. When TriCom is heated in air, cobalt oxide and chromium oxide is formed on the surface of the coating creating a lubricious oxide glaze that protects the coating and counter face from wear. The oxide glaze physically separates the parts and allows them to glide over each other, minimizing wear on both surfaces while preserving sealing integrity.

Coating Performance:
Extensive testing has been performed at ambient and elevated temperatures to characterize the capabilities and service limits of TriCom.

The results of independent ambient temperature wear tests of uncoated, TriCom coated, and Tribaloy T-800 coated samples are presented in (Figure 2). Samples were weighed before and after a linear reciprocating wear test to determine mass lost to wear. TriCom reduced wear of coated and uncoated counter faces to levels lower than T-800 or systems without coatings.

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TriCom® (cont.)

TriCom has also performed well in elevated temperature tests. A coated 10mm diameter ball was tested in linear reciprocating contact at 1350°F. The sample was worn against an uncoated Alloy 718 at a contact stress of 46 ksi for a total distance of 4.9 miles without wearing through the coating (Figure 3).

Table 2 – Test Parameters for Oscillating Wear Tests	
Test Laboratory	IMR Labs, Ithaca, NY
Motion	Oscillatory – 0.1 in stroke (2.54 mm)
Frequency	15 cycles/min.
Test Duration	1000 cycles
Temperature	68° F (20° C)
Contact	Chamfered pin against flat
Contact Stress	14.5 ksi (100 MPa)

In high frequency wear tests at 1350° F (modified ASTM D5707 method), TriCom caused less wear on the counter face than other nickel-cobalt based anti-wear coatings.

Benefits Over Thermal Spray Coatings

Thermal sprayed coatings often need grinding or polishing to meet tight tolerances and ensure a good surface finish. TriCom coated parts are typically coated to net shape with no necessary secondary operations. The coating may be polished or ground to meet a customer's specific requirements if necessary.

The TriCom coating process will not deform thin parts. The thermal spray process will cause dimensional distortion in thin sections as the spray jet impinges upon the part.

Table 3 – Test Parameters for High Temperature Wear Tests	
Test Laboratory	Parker Hannifin Advanced Products, North Haven, CT
Motion	Linear Reciprocating (0.25 inch stroke)
Frequency	145 cycles/min.
Test Duration	622,500 cycles (72 hours)
Temperature	1150° F (621° C)
Contact	10 mm ball on flat
Contact Stress	46.0 ksi (317 MPa)

Applications:
TriCom is typically applied to temperature resistant metals including stainless steel, nickel and cobalt super alloys. TriCom is suitable for use in mildly oxidizing environments, such as air, and carburizing atmospheres including exhaust gasses. Common applications include resilient metal sealing components in land based and aviation gas turbines.

TriCom wears well against most metals, including stainless steel, nickel and cobalt alloys, and cast iron. TriCom should be used in high contact stress systems that experience wear due to differential thermal expansion and vibration. TriCom is best suited for predominately static applications but has been utilized successfully in low speed dynamic systems

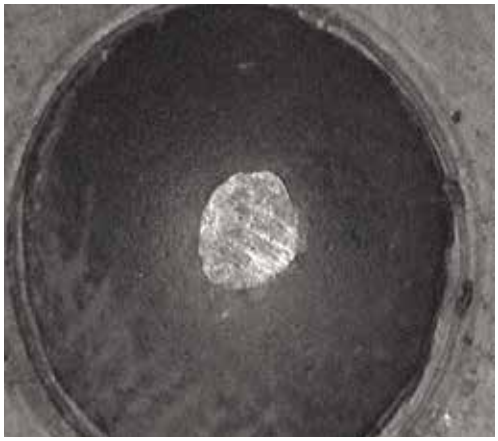

Figure 3: TriCom exhibited excellent wear resistance at 1150° F, surviving 4.9 miles of sliding wear on a 10mm ball. Wear scar diameter is 0.022 inches.