

Rhinoite[®]
Tungsten Carbide Hardfacing



Rhinoite® hardfacing provides bottom-line cost savings and wears five to seven times longer than bare metal in process applications.



Rhinoite®

The Rhinoite® process is an innovative, patented hardfacing process that utilizes state of the art equipment — producing extraordinary results.

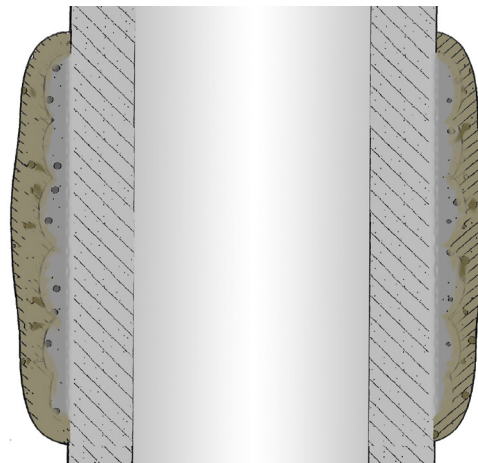
The process can be adapted to all service environments, in every wear application: erosion, corrosion, adhesion and high temperature applications (2200°F). Rhinoite® has been a proven leader of hard metal overlay on elbows, t-sections and choke tubes in chemical plants and refineries. The Rhinoite® weld process focuses on minimizing loss of production time by wearing longer than bare metal.

Rhinoite® Provides Bottom-line Cost Savings

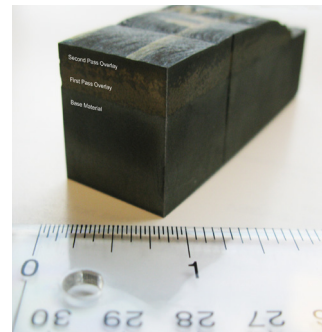
- Minimizes loss of production time by wearing longer in service operations than bare metal
- Reduces frequency of shutdowns servicing to years rather than months
- Eliminates equipment rentals, insulation replacement and inspection frequency
- Reduces required man-hours for overall maintenance of units

Rhinoite® Weld Hardfacing Application Process

1. **Material Selection.** Custom overlay for a wide range of wear applications. Base metal and weld wire selection based on application; carbon steel, stainless steel, duplex steel and Inconel.
2. **Overlay.** Generally a two layer-automated GMAW process with tungsten carbide power dispersed in the first layer.
3. **Finishing.** May grind to desired dimension or leave as welded depending upon application.



Rhinoite® is a patented process that wears five to seven times longer in service operation than bare metal.



Exceptional Wear Resistance

The Rhinoite® weld process has been subject to extensive corrosion and erosion testing. Once tested for 2000 hours with direct salt spray fog, microscopic examination of the carbide coated surfaces at the interim inspection showed little to no effect on the carbide surfaces throughout the test period. Additionally, upon removal of the Rhinoite® overlay product by glass bead abrasive blasting, the component surfaces were virtually unaffected. (ASTM B117 - 90 - standard test method of salt spray).



Image 1



Image 2

Image 1: Syngas choker tube processes water discharge at 9,000 psi / 800°F. Duplex 312 stainless steel overlay.



Image 2: a 12" diameter flexi-coker 90° short radius elbow. It can process coke particles in excess of 600 feet per second and at approximately 400°F. Overlay is .350 thick and duplex 312 stainless steel.

Six inch diameter short radius furnace bend. Duplex 312 stainless steel overlay, base material 304H.



Five inches in length radius furnace bends. The overlay is Duplex 312 stainless. These bends operate at 1200°F.

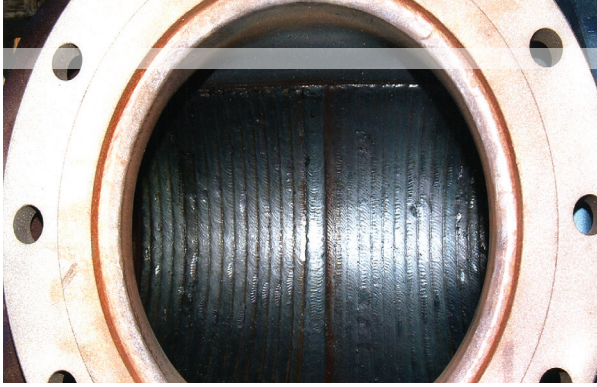


Image 3



Image 4

Rhinoite® Hardfacing

Image 3: 14" diameter, flexi-coker t-section.

Image 4: 5" diameter 304H stainless steel, short radius furnace bend. This elbow's operating temperature is 1200°F. The Rhinoite® weld overlay makes it extremely fluid erosion resistant.

Using an automatic GMAW process an overlay of mild steel wire with dispersed cemented metal carbide pellets is applied to a base material. The result is a weld overlay with embedded hard particles of carbide that can be diamond ground down to desired dimensions. The process provides improvements in wear resistance that enables the component to have an extended service life even when used in highly erosive and/or corrosive environments.

- Tungsten carbide content
- Fluid erosion resistant
- Corrosion resistant
- Oxidation resistant
- Thickness up to 3/8"



10" diameter, de-coke t-section. The overlay is 200° grid, .350 thick.



Coker scrubber nozzle, 316 stainless steel, Duplex 312 overlay. This nozzle can process 3,000 gallons of water per minute.

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Image 5: 50X zoom showing tungsten pellets in the matrix.

Image 6: 50X zoom showing pellets next to substrate condition of heat affected zone showing no cracking or stress.

Applications.

- Elbows
- Pumps
- Valves
- Stabilizers
- Bearings
- T-sections
- Furnace bends
- Furnace caps
- Coker nozzles
- Choker tubes

Benefits.

- Minimizes loss of production time by wearing five to seven times longer in service operations than bare metal
- Reduces frequency of shutdown times to years rather than months
- Eliminates equipment rentals, insulation replacement and inspection frequency
- Reduces required man-hours for overall maintenance of units
- Improved safety by reducing the risk of equipment failure

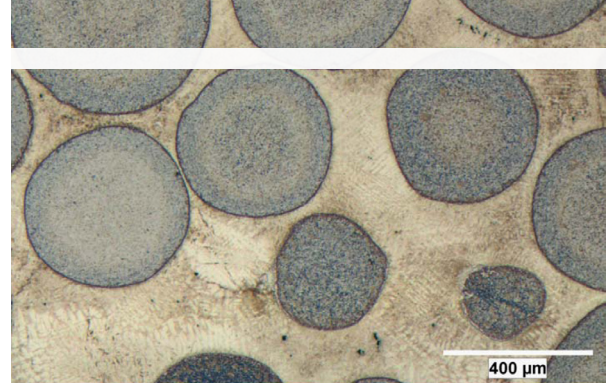


Image 5

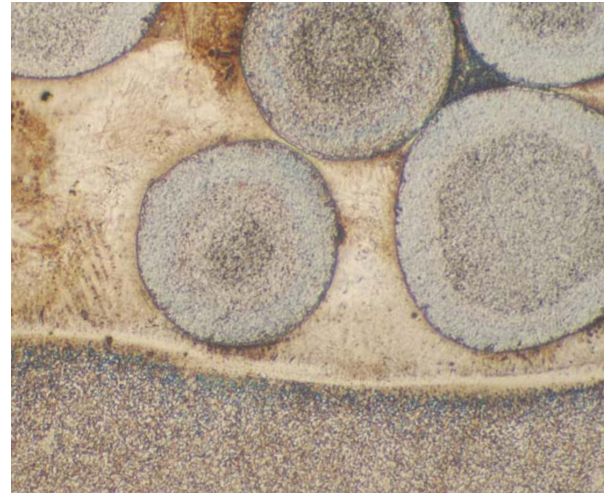
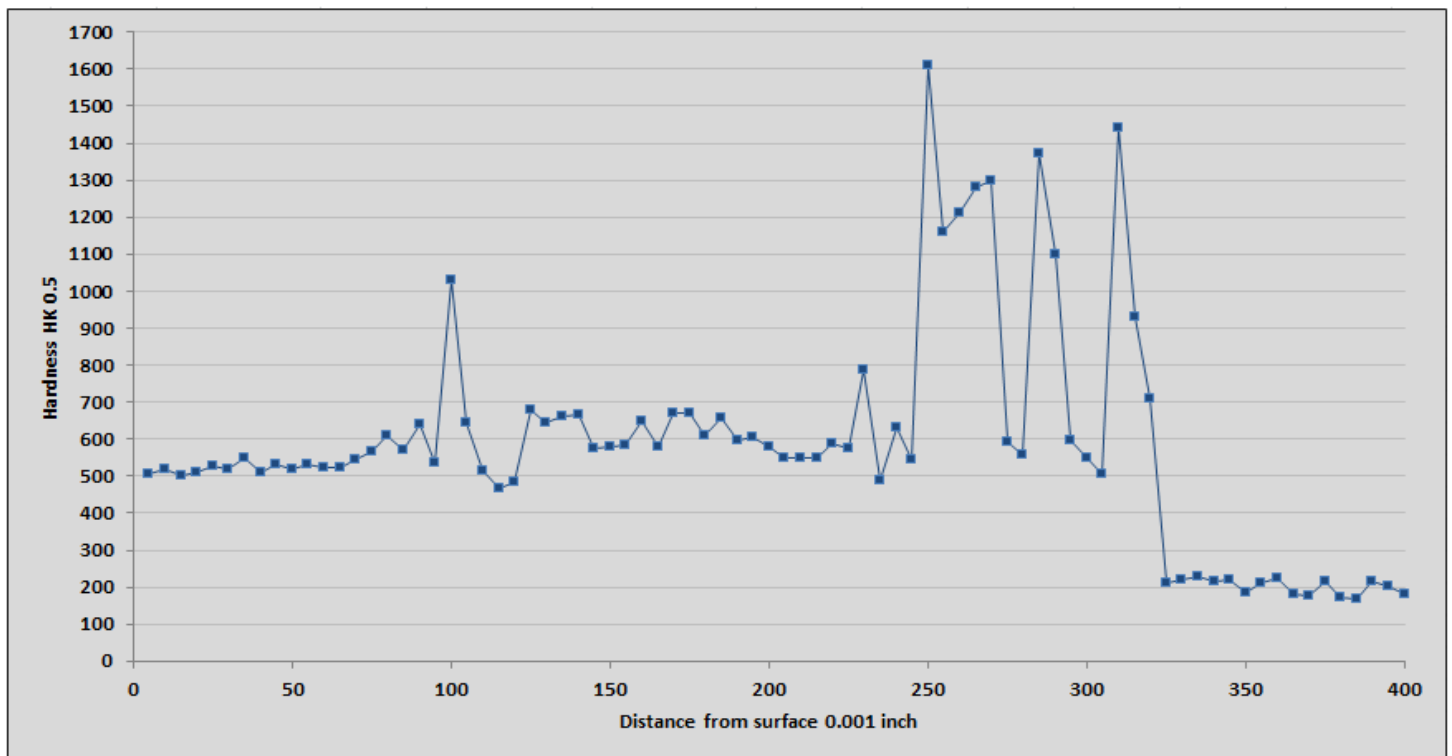


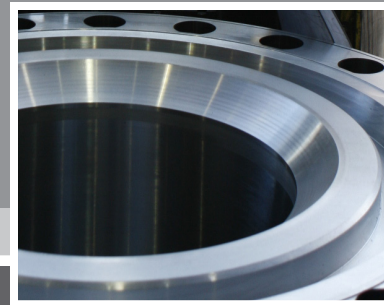
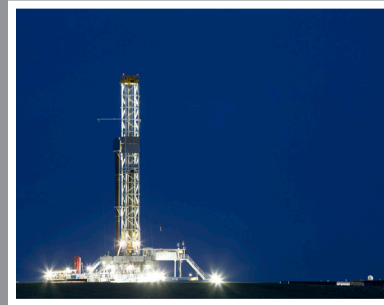
Image 6

Rhinoite® Hardfacing - Report of Hardness Profile Knoop 0.5 Kg Load Test Results

#	Distance from surface (in)	Reading HK 0.5	#	Distance from surface (in)	Reading HK 0.5	#	Distance from surface	Reading HK 0.5
1	0.005	505	28	0.140	665	55	0.275	593
2	0.010	519	29	0.145	577	56	0.280	557
3	0.015	501	30	0.150	580	57	0.285	1370
4	0.020	509	31	0.155	583	58	0.290	1100
5	0.025	529	32	0.160	650	59	0.295	599
6	0.030	521	33	0.165	580	60	0.300	551
7	0.035	551	34	0.170	672	61	0.305	506
8	0.040	511	35	0.175	672	62	0.310	1440
9	0.045	532	36	0.180	609	63	0.315	932
10	0.050	521	37	0.185	657	64	0.320	710
11	0.055	532	38	0.190	599	65	0.325	213
12	0.060	524	39	0.195	605	66	0.330	218
13	0.065	524	40	0.200	580	67	0.335	230
14	0.070	543	41	0.205	548	68	0.340	216
15	0.075	565	42	0.210	548	69	0.345	219
16	0.080	609	43	0.215	551	70	0.350	187
17	0.085	571	44	0.220	590	71	0.355	213
18	0.090	639	45	0.225	577	72	0.360	225
19	0.095	535	46	0.230	788	73	0.365	181
20	0.100	1030	47	0.235	490	74	0.370	176
21	0.105	646	48	0.240	633	75	0.375	216
22	0.110	516	49	0.245	543	76	0.380	172
23	0.115	466	50	0.250	1610	77	0.385	170
24	0.120	484	51	0.255	1160	78	0.390	217
25	0.125	680	52	0.260	1210	79	0.395	204
26	0.130	646	53	0.265	1280	80	0.400	179
27	0.135	664	54	0.270	1300			



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