JK® 576 Stellite® 6 Powder

Technical Note
Date: 12/16/03
Replaces: 4/9/99
No: C-008

DESCRIPTION

JK®576, STELLITE® 6 powders is a cobalt-chromium alloy recommended for high temperature applications where resistance to abrasive grains, hard surfaces fretting, or particle erosion is encountered. JK®576 powders can be used at temperatures up to 1500 °F.

COMPOSITION, Wt. %

Carbon	1.15	Nickel	3.0*
Chromium	27.75	Iron	3.0*
Cobalt	Balance	Silicon	1.15
Tungsten	4.50		

* Maximum

SIZE DISTRIBUTION

270 Mesh / 15 micron

COATING CHARACTERISTICS

The parameters that follow are to be considered as starting JET KOTE® parameters. The following coating properties are representative of results of coatings obtained from commercial available JK®576 powders.

	SET A	SET B	Set C
Microhardness, DPH [300g]	472-590	579-615	532-615
Macrohardness, 15N (Rc) Average	81.8-88.3 (43-51)	83.5-87.2 (46-53)	84.4-85.7 (48-51)
Bond Strength, KPSI (per ASTM 633) Average	10.5 CS (12.3*)	7.0 CS (12.0*) 11.5 on 416 SS	4.3 CS
Estimated coverage, LB/Ft /. 010"	.6	.6	.6
Deposit Efficiency Approximate, %	55	55	60
Est. Surface Finish, Microinch AA			
-As Sprayed	280-420	120-250	280-420
-Ground and Lapped	5-10	1-4	5-10
Maximum Coating Thickness, Inches	.030	.030	.030
As-sprayed on cylindrical shapes	(.060**)	(.080**)	(.060**)
Maximum Coating Thickness, Inches*	.015	.025	.015
As-sprayed on flat or irregular shapes	(.045**)	(.060**)	(.045**)
Maximum Service Temperature, °F	1500	1500	1500
Coating Density, g/cm^3	7.37	7.2	NA
Abrasive Wear Resistance, mm loss	22.8	20.4	NA
30 LB load, 500 revolutions (ASTM G65)			

(*) Indicates higher coating thickness and bond strength is achievable with .0005”-. 001” JK®117 as an undercoat or bond coat.

** Thickness and bond strength limits depend on use of coatings part composition, size and configuration.

The above data in no way constitutes a specification. Parameters and other technical information in this document are for guidance only. Stellite Coatings may make changes as additional data becomes available.

FINISHING

JK®576 Coatings must be finished by WET grinding:

Grinding:

Option 1: SiC Grinding
Wheel type, 220 SiC Vitrified bond (friable)
H hardness
.035" - .075" cross-feed/pass
40-65 ft./min. surface speed
.0005" - .001" in-feed/pass

Substitutions for wheel specifications may be required if coarse grinding is desired.

Option 2: Diamond Grinding
Wheel type, 100-240 Mesh Resinoid Bond Diamond (Friable Shape)
L, P, or R Hardness
50 Concentration
.035" - .050" Cross-feed/Pass
40-50 Ft./Min. Surface/Speed
.0005" In-feed/Pass

Heavy Duty Grinding:

Use all of the above but substitute a wheel with 100 mesh, nickel-clad diamonds in a resinoid bonded matrix, and hardness of R. Large surfaces may require a softer wheel.

1. Important! Diamonds must be periodically relieved by dressing the wheel to insure proper grinding.
2. Irreversible damage to the coating can occur when the grinding wheel specifications and/or the grinding technique is incorrect.

POLISHING AND LAPPING:

SiC or diamond media is recommended. Aluminum Oxide media does not cut stock properly. Do not lap coatings dry. Use a lubricant as recommended for the particular media used in each step. Remove debris, wash and dry the coating surfaces prior to proceeding to the next grit size. Avoid contamination of the lapping surfaces by cleaning prior to application of fresh media.

Recommended grit size progression after grinding:

320, 400, and 600 - U.S. screen sizes

Super finishing is best done with diamond media and recommended progression is as follows:

15 or 9 micron - paste or slurry
6 or 3 micron

PARAMETER NOTES (See Pages 4-6):

1. Pressures shown are running pressures with powder feeding.
2. Manifold pressures for JK®II system are critical, manifold regulators must be located at factory supplied hose ends.
3. Manifold pressure too low will not allow enough flow. If it is too high the controller will pulse upon start up.
4. JK®II system does not correct flow due to change in gas temperature or pressures at the meters, JK®IIA system compensates and flow is displayed as true Standard Cubic Feet per Hour (SCFH):

   $T = 0\ ^{o}C$ $P = 14.7$ PSIA
5. A heat exchanger to control the water inlet temperature to the gun is recommended. Adjust water flow to achieve outlet temperature. Water temperatures may affect coating quality and torch performance.
6. Powder feed rate must be checked with powder flowing through lit gun.

   Powder Feed Rate (PFR) = (Powder Weight (g) Initial-Powder Weight Final (g)/ Powder Feed Time (min.)

   Powder feed time must be greater than 1 min. PFR is linear to RPM of the feeder. To achieve required PFR, change RPM as follows:

   RPM (NEW) = (PFR (Required) X RPM (Original))/ PFR (Calculated)
7. JK®II flowmeter requires change for specific gas use:

   H_2 - Part #972915 C_3H_6 - Part #972763
8. Maximum console inlet gases pressure is 150 PSI.
9. Console pressures shown are for JK®IIA, JK®III pressures are anticipated to be similar but not proven.
10. Confirm with Stellite Coatings Engineering group if your JKIIA is capable of running methane gas via your unit H_2 mass-flowmeter, if so then this value may be used to initial establish operating conditions.
11. Ignition of JK®IIA with methane or natural gas as pilot and main fuel requires ramping the manifold pressure manually from approximately 95 psig to 140 psig during cycle start. If procedure is improperly done the flame may not light and/or the gas could explode violently. To extinguish the flame, the reverse procedure must be used.
12. Pressures are shown are for reference. Due to different differential pressures caused by different torch, torch hose bundles and console, conditions shown are significantly broader than reproduced runs with one system. Reproduced ranges on a single Jet Kote® system is typically less than 5 psig variation. JK®IIA and JK®III systems are usually reproduced less than 3 psig variations.

SET A OPERATING PARAMETERS (1)

Fuel Gas	Propylene (C_3H_6)
Powder Carrier Type	Argon (Ar)
Nozzle	5/16 x 6
Injector	#50

Console Type	JK®II	JK®II NOVA-A	JK®IIA /JK®III
Manifold Pressures, PSI	(2) (7)	(8)	(3) (9)
Oxygen	120	120	100
Main Fuel Gas	80	80	80
Carrier Gas	85	80	85
Hydrogen (Pilot)	25		100
Console Pressures, PSI (12)			
Oxygen	75-85		62-75
Main Fuel	60-68		80-86
Carrier	48-50		48-50
Console Flows (4)			
Oxygen	980-1020	980-1020	990-1020
Main Fuel	56-60%	115-120	130-137
Carrier	30-35	57	57
JK®IIA Console Settings			
Oxygen			54.0-57.2
Main Fuel			43.3-46.7
Carrier			40.0-57.1
Cooling Water (5)			
°F IN	80-90	80-90	80-90
°F OUT	115-120	115 -120	115 –120
Flow, GPM	8-9	8-9	8-9
Powder feed Settings			
RPM (Approximate)	2.0	2.0	2.0
Feed Rate (6), grams/Min.	40-45	40-45	40-45
Spray Distance, Inches	6-7	6-7	6-7

Thickness Per Pass, Inches	.001 maximum
Torch to Part speed, Ft/Min.	200-300
Torch Move Per Pass, Inch/Rev.	.100

Preheat Recommended, If Possible

Cooling **AVOID EXTREME COATING TEMPERATURE VARIATIONS!**

- IF USED DIRECTLY ON COATING AREA, STOP WHEN FLAME IS OFF COATING AREA
- AIR COOLING OF UN-COATED AREA PERMITTED

Maximum Part Temperature During Application of Coating is 400°F.

Notations above (1-12) please see page 3 for details.

SET B OPERATING PARAMETERS (1)

Fuel Gas	Hydrogen (H_2)
Powder Carrier Type	Argon (Ar)
Nozzle	1/4 x 9
Injector	#40

Console Type	JK®II	JK®II NOVA-A	JK®IIA /JK®III
Manifold Pressures, PSI	(2) (7)	(8)	(3) (9)
Oxygen	120	120	100
Main Fuel Gas	120	120	100
Carrier Gas	85	80	85
Hydrogen (Pilot)	25		100
Console Pressures, PSI (12)			
Oxygen	46-50	50-56	49-54
Main Fuel	70-73	68-74	67-72
Carrier	44-51	44-51	44-51
Console Flows (4)			
Oxygen	400-450	425-450	425-450
Main Fuel	1200	1150-1160	1150-1160
Carrier	30-35	57	57
JK®IIA Console Settings			
Oxygen			23.6-25.0
Main Fuel			63.9-64.1
Carrier			44.3-47.1
Cooling Water (5)			
°F IN	85-95	85-95	85-95
°F OUT	115-120	115-120	115-120
Flow, GPM	12-13	12-13	12-13
Powder feed Settings			
RPM (Approximate)	1.8-2.0	1.8-2.0	1.8-2.0
Feed Rate (6), grams/Min.	30-35	30-35	30-35
Spray Distance, Inches	7	7	7

Thickness Per Pass, Inches	.001 maximum
Torch to Part speed, Ft/Min.	200-300
Torch Move Per Pass, Inch/Rev.	.100

Preheat Recommended, If Possible

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SET C OPERATING PARAMETERS (1)

Fuel Gas	Methane (CH_4)	
Powder Carrier Type	Nitrogen	
Nozzle	5/16 x 6	
Injector	#50	
Console Type	**JK®IIA**	**JK®III**
Manifold Pressures, PSI	(3) (11)	(9)
Oxygen	100	90-95
Main Fuel Gas	140	90-95
Carrier Gas	85	85
Console Pressures, PSI (12)		
Oxygen	77-87	77-87 (estimated)
Main Fuel	73-79	73-79 (estimated)
Carrier	45-50	45-50
Console Flows (4)		
Oxygen	1000	1000
Main Fuel	276 (350 H_2 reading[10])	276
Carrier	77	77
JK®IIA Console Settings		
Oxygen	55.6	
Main Fuel	19.7 (19.4 Using H_2 flowmeter[10])	
Carrier	77.0	
Cooling Water (5)		
^oF IN	85-95	85-95
^oF OUT	115-120	115-120
Flow, GPM	11.8-12.5	11.8-12.5
Powder feed Settings		
RPM (Approximate)	1.8-3.7	1.8-3.7
Feed Rate (6), grams/Min.	31-65	31-65
Spray Distance, Inches	8	8

Thickness Per Pass, Inches	.001 maximum
Torch to Part speed, Ft/Min.	200-300
Torch Move Per Pass, Inch/Rev.	.100

Preheat Recommended, If Possible

Cooling **AVOID EXTREME COATING TEMPERATURE VARIATIONS!**

- IF USED DIRECTLY ON COATING AREA, STOP WHEN FLAME IS OFF COATING AREA
- AIR COOLING OF UN-COATED AREA PERMITTED

Maximum Part Temperature During Application of Coating is 400^{o}F.

Notations above (1-12) please see page 3 for details.