Silicon Carbide for Extreme

WE Series Nozzles

WEAR APPLICATIONS
NITRIIDE BONDED SILICON CARBIDE

Nitride Bonded Silicon Carbide is a water based thixotropic compound with several different grit sizes of silicon carbide and silicon oxide particles. A ceramic material with excellent resistance to corrosion, chemical inertness and abrasion. The mixture of high purity Silicon Carbide grains, alumina fine powder, silicon metal powder and other compound goes through a sintering process at 1400 to 1500 degrees C, during which the furnace is filled with pure nitrogen. The silicon reacts with the nitrogen to generate Si N, producing a two phase composite of 75% SiC and 23% Si N.

Properties
Maximum Bulk Density : 2.6 gm/cc
Apparent Porosity : approximately 15 to 16%
Average Modulus of Rupture : 7,000 psi +/- 1,000 psi
Average Crushing Strength : approximately 20,000 psi

NSIC has the properties of high strength, strong oxidation resistance ability. It can withstand high operating temperature up to 1450 deg C

REACTION BONDED SILICON CARBIDE

Reaction Bonded Silicon Carbide is a formulation of finer particle sizes of silicon carbide with carbon into a homogeneous mixture. Fired at high temperature in the presence of silicon, the vapour silicon penetrated the compound reacting with the carbonaceous contents, thereby achieving thorough filling of all porosity in the molecular structure with silicon carbide. The characteristics of fine molecular grain structure is smooth and uniform as a result.

Properties
Maximum Bulk Density : 3.0 gm/cc
Apparent Porosity : 0 (Zero) gm/cc
Average Modulus of Rupture : 50,000 psi +/- 3,000 psi
Average Crushing Strength : approximately 320,000 psi

With zero apparent porosity at molecular level, the bulk density (gm/cc) and the crushing strength (psi) is many times higher. These features allow spiral nozzles to be manufactured in intricate designs of sharp edges and precise dimensional accuracy. Complex shapes with higher strength capability to take on the most demanding of FGD conditions.
WILSON ABSORBER NOZZLE

SPRAY CHARACTERISTICS
Uniform distribution of Spray Droplets
Large Flow Passage. No internal vanes. Spray angle from 90 to 120 degrees
Single or Twin Tangential Discharge

MATERIALS OF CONSTRUCTION
One piece construction.
No clog and no internal parts.
Material in Nitride Bonded Silicon Carbide (NSIC) and Recrystallized Silicon Carbide.
Connections in Flange, thread, bell & spigot joint, butt Joint.
Epoxy adhesive for bonding Fiberglass Reinforce plastic pipe.
Single cast from nitrogen fired furnace
Flow-rate from 86.6 to 3499 litres per minute
Size range from 2 to 4 inches

ORDERING METHOD
Model : 4WE483SiC(Twin)120
Size : 4 inch diameter
Nozzle Number : WE483
Material : Silicon Carbide (NSIC)
Twin : Double Tangential Discharge
Spray Angle : 120 degrees Hollow Cone Connection : Laminated or Flange or Thread (NPT or BSP).

Maximum Recommended Pressure : 5 Bar(G).
Maximum Recommended Temperature : 1650 deg C.
Flow Rate (Q_m) = K' x F

FLOW RATES AND PRESSURE CHARACTERISTICS - Hollow Cone 90 degrees or 120 degrees

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DESIGN SPECIFICATION:
Nozzles are designed according to ASTM E799-92 (Pre-approved 1998)
as per "STANDARD PRACTICE FOR DETERMINING DATA CRITERIA AND PROCESSING FOR LIQUID DROP SIZE ANALYSIS"

Page 2
High Flow - Full Cone Wear Resistant

DESIGN FEATURES
- Recrystallized Silicon Carbide or Cobalt Alloy 6
- High energy efficiency
- No internal parts
- Clog-resistant
- Connections to FRP pipe by flange, lamination overlay or clamp.

SPRAY CHARACTERISTICS
- Fine atomization
- Spray pattern: Full Cone / Hollow Cone
- Spray angles: 90° and 120° standard
- Flow rates: 2.26 to 10700 l/min

Flow Rate (l/min) = K bar

90 degrees Full Cone  120 degrees Full Cone  HOLLOW CONE SPRAY

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MATERIAL DESCRIPTION  TEMPERATURE RATING (F)  ASTM CODE
Stellite 6 or Cobalt Alloy 6  1900 degrees F  AMS 5387
Incoloy 625  2000 degrees F  AMS 5402
Hastelloy C22  2000 degrees F  A494
Hastelloy G  2000 degrees F  B581

TIP MATERIAL: STELLITE 6 (COBALT ALLOY 6), INCONEL625, RBSC (REACTION BONED SILICON CARBIDE)
TYPES OF CONNECTIONS

There are four types of connections that can be used to inter-connect the Silicon Carbide Nozzles to the FRP pipe.

1) DIRECT LAMINATION OR BONDING
Epoxy adhesive for direct bonding to fiberglass reinforce plastic pipe and fitting using Butt Joint (overlay), Bell & Spigot joint or Taper-Taper adhesive Bonded Joint.
Epoxy glue lined on the inside of the nozzle inlet and on the nipple insert inter-connect to the FRP pipe for permanent bond. Once installed, the nozzles are removed either by chiseling or sawing the inlet snub. The FRP stub must then be re-surfaced in order to attach a new nozzle.

2) THREAD CONNECTIONS
Piping system typically use NPT, BSP or machined thread systems.
Polypropylene piping systems generally use coarse, non-tapered thread systems, such as Acme or Trapezoidal metric. The nozzles attached to polypropylene piping systems generally have internal threads.

3) FLANGE CONNECTIONS
Flange connections are commonly used in Fiber Reinforced Plastic (FRP) piping system. Typically, ANSI 150# or DIN PN 6 flanges with 8 bolts arrangements.

CONNECTIONS TO PIPE

NOZZLE SLIP-ON WITH SLEEVE TO FRP PIPE

STEP 1

STEP 2

STEP 3

REPAIR AND REPLACEMENT OF SILICON CARBIDE NOZZLES FOR MAINTENANCE.
SAMPLING TECHNIQUES

Utilising the spatial sampling technique to gather maximum repeatable test results in accordance to ASTM E799-92. It includes the use of high speed camera to capture images at a rate of 1000 frames per second. To accurately record and compare all the droplet size data and the quantity of droplets in its size class bounds.


TYPICAL DROPLET ANALYSIS

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ATOMISER                          | XA307       |
LIQUID PRESSURE                   | 24 PSIG     |
ATOMISING GAS                     | AIR         |
GAS FLOW RATE                     | 5.32 SCFM   |
OAP PERIOD                        | 60 SEC      |
MERGE DIAMETER                    | 50 UM       |

FSSP SAMPLING LOCATION: 12" HORIZONTAL TRAVERSE
OAP SAMPLING LOCATION: 12" HORIZONTAL TRAVERSE
SUPPLEMENTAL INFORMATION: 10 MM DEPTH OF FIELD

DISTRIBUTION PARAMETERS

LENGTH MEAN DIAMETER (D10): 21.11 UM
AREA MEAN DIAMETER (D20): 30.25 UM
VOLUME MEAN DIAMETER (D30): 42.43 UM
SAUER MEAN DIAMETER (D32): 83.48 UM
STANDARD DEVIATION (VOL): 59.20 UM
COEFFOF VARIATION (VOL): 0.483 UM

NUMBER MEDIAN DIAM. (DN,5): 14.85 UM
VOLUME MEDIAN DIAM. (DV5): 119.37 UM
10% Ø VOLUME DIAMETER (DV1): 42.70 UM
50% Ø VOLUME DIAMETER (DV9): 200.07 UM
MAXIMUM DIAMETER (VOLUM): 305.00 UM
UNIFORMITY INDEX (VOLUME): 0.401 UM

The following charts show the estimated Sauter mean diameter of droplets for various flow rates of typical 90 degrees hollow and solid cone spray patterns based on water.
**Refractory Product & Services**

**Wilson Engineering** offers a wide range of refractory services for our clients. We offer quality refractory products, installation services, one-stop solutions and complete lining concepts. Refractory engineering are carried out on Computer-Aided-Design systems. We provide detailed project documentation, which include installation instructions. We also provide hassle free full maintenance program for our customers, where we will closely monitor the refractory condition and reduces the unwanted shutdown frequency. In addition, we provide technical study support, which recommends materials which are suitable for the customer needs and operation requirements.

Through active co-operation, **Wilson Engineering** offers its partners design, planning and implementation of solutions associated with all aspects of refractory work.

**Our Services:**

- Complete lining concept.
- Refractory Engineering work.
- Detailed project documentation including installation instructions, heat transfer calculation.
- Refractory maintenance and repair service.
- Complete installation and lining supervision by experience engineers.

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**Our Products:**

- Shaped product based on silicon carbide, fireclay and alumina.
- Specially shaped bricks for particular application and process.
- Unshaped refractories for a wide variety of applications.
- High temperature insulation (insulating bricks and concrete, fibre products).
- Ceramic and metallic anchoring systems for all applications.
MANUFACTURER

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Catalogue No: 7904