

Ceramic Wear Surfaces

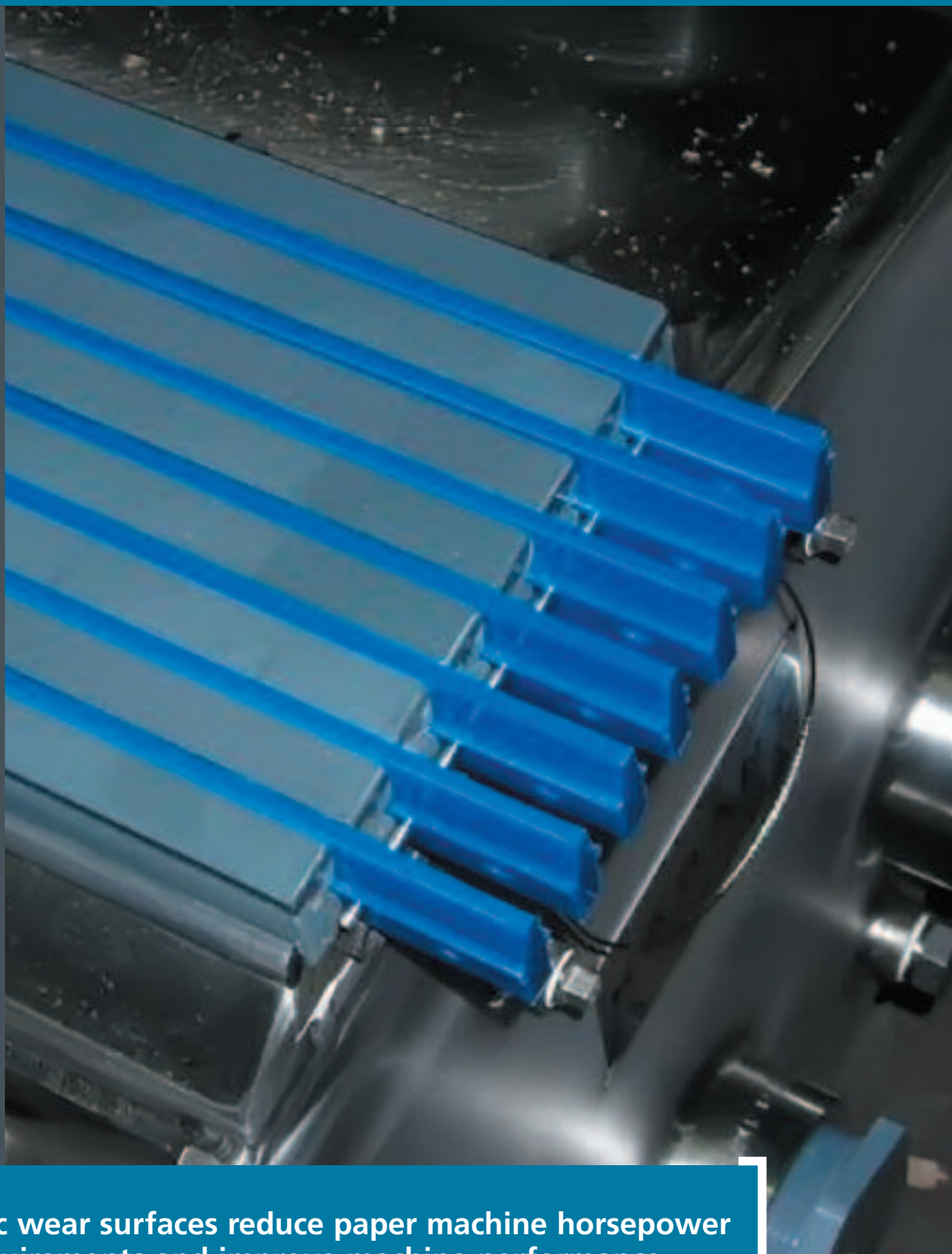
Forming and press section ceramics

KADANT
AN ACCENT ON INNOVATION

Reduce energy
consumption and
increase wear life.



Ceramic wear surfaces reduce paper machine horsepower requirements and improve machine performance.



Ceramic Wear Surfaces

Ceramic properties: how they affect material suitability

The following are the most important properties of ceramic wear surface materials:

Thermal Shock Resistance: How much sudden temperature change a ceramic can withstand without cracking. Silicon Nitride has the greatest resistance to thermal shock.

Thermal Expansion: The degree to which the material expands under heat. Matching coefficients of expansion between ceramic and ceramic carrier is critically important. Differing rates of thermal expansion can cause ceramic to crack.

Surface Finish: Smoothness scale for ceramic surface. The smoother the ceramic surface results in less drag load and lower energy consumption. Silicon Nitride and Silicon Carbide offer the best surface finishes.

Flexural Strength: The ability of the material to withstand torsional and deflection loads found in applications like forming board lead blades, and where foils are frequently handled.

Thermal Conductivity: A material's ability to conduct, rather than absorb, heat. Higher conductivity will prevent unnecessary heat build-up that can damage fabrics. Zirconia has a very low conductivity rate.

Fracture Toughness: A measurement of how a material withstands physical shock. This property is important for positions like the forming board, where vibration and shock are particularly present.

Density: Weight of the material. An especially dense ceramic, like Zirconia, may prove too heavy for existing support system.

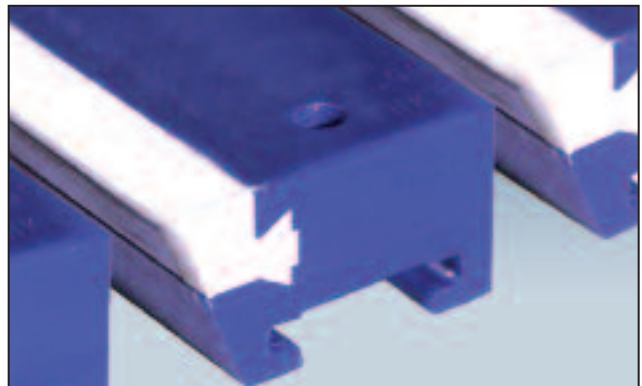
Vickers Hardness: This is a hardness scale and can indicate wear life expectations. Silicon Carbide has the highest Vickers Hardness; Zirconia has the lowest.

Coefficient of Friction: The amount of drag the surface exerts on the fabric. Higher friction coefficients mean more wear to machine fabrics—and more energy required for machine drives.

Cost: A ceramic's price. Only one variable to consider when determining total cost-effectiveness. Others, like ceramic wear life, fabric wear, and fabric and ceramic replacement costs, must also factor into the equation.



Ultrawear AL™ Ceramic Wear Surface



Ultraset F™ Ceramic Wear Surface

All Ceramic Materials Are Not the Same

Alumina Ultrawear AL™

Ceramic Wear Surfaces

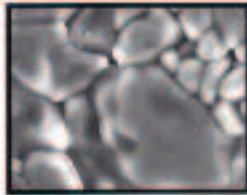
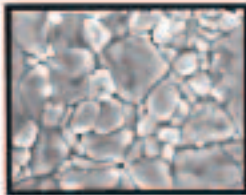
Advantages: Low cost; good wear and corrosion resistance; moderate machine drag.

Disadvantages: Low thermal shock resistance; can cause high fabric wear.

Applications: Fourdrinier, except on flatboxes when calcium carbonate is used.



Magnified x500



Magnified x1000

Silicon Nitride Ultrawear SN™

Ceramic Wear Surfaces

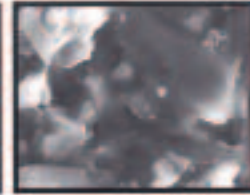
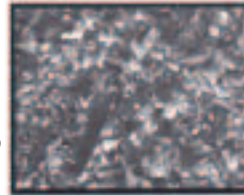
Advantages: High thermal shock resistance; low fabric wear, low drive load; best all-around combination of wear, chip, and corrosion resistance.

Disadvantages: Cost

Applications: High stress applications, like suction boxes and felt strips; all applications where calcium carbonate is used.



Magnified x500



Magnified x2000

Silicon Carbide Ultrawear SC™

Ceramic Wear Surfaces

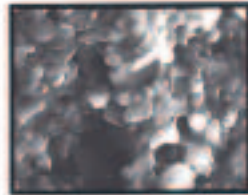
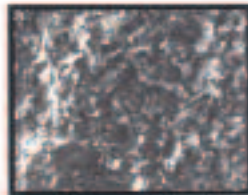
Advantages: The hardest, most wear resistant ceramic; moderately high thermal shock resistance.

Disadvantages: High cost; susceptible to chipping; lower thermal shock than Silicon Nitride; higher thermal stress than Silicon Nitride.

Applications: All applications where severe ceramic wear is present.



Magnified x500



Magnified x2000

| Property | Kadant Solutions Ceramics | | | |
|---|---------------------------|-----------------|-----------------|-------------------|
| | Alumina | Silicon Nitride | Silicon Carbide | Zirconia* |
| Bulk Density | 3.8 | 3.2 | 3.2 | 5.7 |
| Flexural Strength (kg/m) | 31 | 60 | 55 | 65 |
| Vickers Hardness (kg/mm ²) | 1650 | 1400 | 2000 | 1250 |
| Thermal Expansion (10 ⁶ /C°) | 7.1 | 2.6 | 4.0 | 11.1 ¹ |
| Fracture Toughness (MN/m ^{3/2}) | 3.5 | 5.7 | 5.6 | 9 |
| Thermal Shock Resistance (ΔT C°) | 200 | 550 | 400 | 300 ¹ |
| Thermal Conductivity (cal/cm. sec. C°) | 0.06 | 0.05 | 0.15 | 0.0009 |
| Coefficient of Friction | High | Very Low | Moderate | Low |

* Note: Kadant does not recommend Zirconia for use in any wear surface application.

¹ Note: Characteristics that lead to Zirconia cracking.

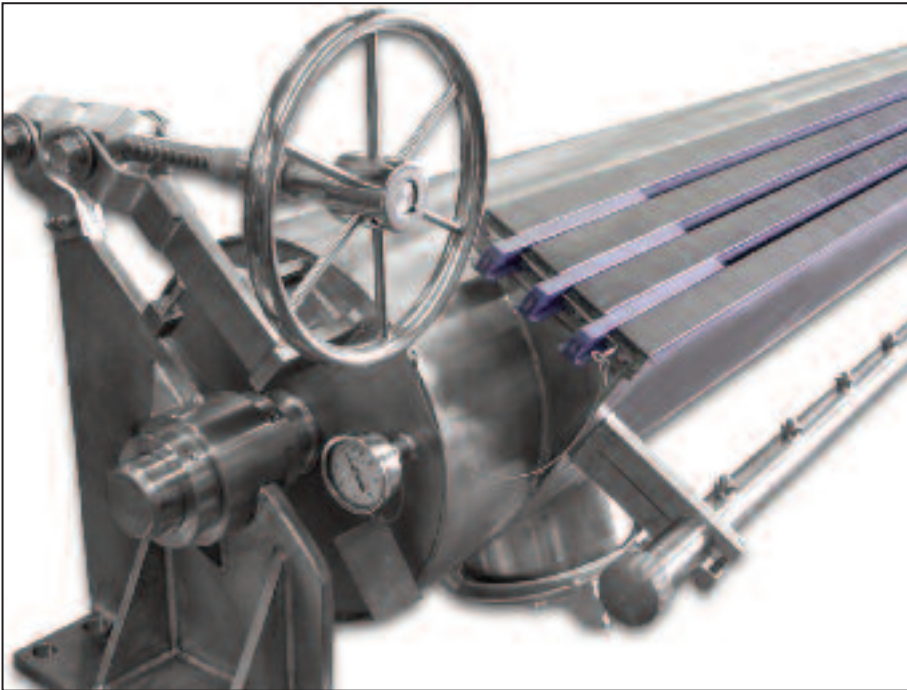
Not All Ceramic Materials Are the Same

Ultrawear SN™ Ceramic Wear Surfaces: the only suitable material for felt strips

There is only one overwhelming factor to consider in felt wear strip applications: thermal shock. It occurs so often that only the most shock-resistant ceramic, silicon nitride, can provide any real protection against thermal shock-induced cracking and piano-keying. Accordingly, all our felt strips are made of Kadant's silicon nitride: Ultrawear SN. Developed by a leading ceramics supplier, Ultrawear SN combines an especially smooth surface (8 RA max.) to reduce fabric wear and drive loads, optimum wear and chemical corrosion resistance, and outstanding fracture toughness to minimize cracking. Coupled with its thermal shock resistance, Ultrawear SN assures superior longevity and surface stability.

Benefits:

- ▶ Longevity—Ultrawear SN wear strips have up to twelve times the life of poly strips.
- ▶ Can handle thermal shock conditions without cracking better than any other wear surface material.
- ▶ Dovetail blade design eliminates cracking from thermal expansion.
- ▶ Ultrawear SN structural density reduces surface abrasiveness, helps felts last longer—especially when calcium carbonate fillers are used.
- ▶ Epoxy bonding eliminates piano-keying.
- ▶ Lowest coefficient of friction of any available surface material for less drag load on drives.
- ▶ Fully interchangeable with most poly wear strips.



Ultrawear SN used for Uhle box wear strips.

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