



Coating Solutions for the Paper and Printing Industries

# High Gloss or with Billions of Cavities

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The method used to produce paper has not changed fundamentally over the years. However, the manufacturing and printing of paper have developed into complex processes in which many factors influence the quality of the product. Modern paper and printing machines have to deliver more than just visible quality: they must be flexible and reliable, while consuming less energy, supporting environment-friendly processes, and operating at a low level of cost. The coating solutions produced by Sulzer Metco play an important role in fulfilling these partly contradictory requirements.

▶ The surface quality of graphic paper—and the finish that can therefore be achieved when printing high-gloss magazines or photos—is influenced to a significant extent by supercalendering. The supercalendering process consists of smoothing the paper sur-

face in a calender—a vertical system of harder and softer rolls through which the paper is drawn in a serpentine path. The raw paper, which is coated in china clay or other mineral materials, assumes the desired surface characteristics—primarily gloss and

smoothness—as a result of the high pressure and high temperatures (up to 200 °C) to which it is subjected during the process.

### Quality Paper

The core components of a calender are the heated rolls, which can be up to 13m in face length and 1m in diameter and can have a mass of over 50t. The surface of the heated rolls largely determines the surface quality of the paper that is produced (Fig.1). Each roll is subjected to considerable loads and heavy wear due, in particular, to the abrasive minerals in the coating color and the Doctor blade. Large loads on the pressure line (nip), the high rotation speed, and corrosion due to steam and chemical additives in the coating color, also affect the surface of the rolls.

### Tailored Solutions

HVOF (high-velocity oxy-fuel) sprayed WC/CoCr layers—roll covers in the language of paper manufacturers—have gained ground in recent years as the best solution for calender rolls (Fig.2). Based on its many years of experience—working in conjunction with plant manufacturers and papermakers—Sulzer Metco can provide customers with comprehensive, tailored solutions to fulfill their complex requirements. Sulzer Metco offers a range of HVOF processes that can be operated using gaseous and liquid fuels, thus enabling the customer to select the best process to meet its manufacturing needs. Sulzer Metco Woka, a German subsidiary of Sulzer Metco, produces carbide powder with extremely fine and uniform primary carbides that are calibrated very

precisely for use in the different coating processes.

Sulzer Metco is not only a manufacturer of systems and powders, but also operates a high-performance coating service that has been coating calender rolls under the trade name Sume®Cal for many years.

### Constant High Surface Quality

The surface of the calender is polished to a high gloss so that the roughness Ra is less than 0.04 μm. The high wear resistance of the coating means that the roughness will increase only very slowly over the long operational lifetime of the calender. This offers the customer a number of benefits, including very constant, excellent paper quality in terms of gloss and smoothness, as well as low maintenance costs, since the operational lifetime of the roll—up until the point when it is first repolished—is significantly longer than that of uncoated or chrome-plated rolls.

### High Print Resolution

While calender rolls must have the smoothest possible surface, the standards for printing rolls—such as the anilox rolls that are used in large numbers for the very common flexographic printing process—are completely different. Anilox rolls apply the print color with a fine dot pattern and transfer it to a counter roll or directly to the paper path. Ink cells with a diameter ranging between 20 and 100 μm, which later dose the ink in the printing process in very small drops, are engraved into a finely polished, plasma-sprayed chromium oxide layer by means of a laser beam (Fig.3). A specific number of



1 The surface of calender rolls has a significant impact on the quality of the paper. Coatings produced by Sulzer Metco ensure that a constant high level of quality can be maintained over a long period.

ink cells are required per unit length, depending on the desired printing quality. At present, 150–1200 lines per inch (lpi) is normal.

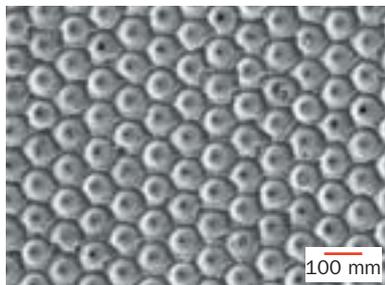
### Coating Service

The coating of anilox rolls places the highest demands on the process stability of plasma spraying, because a large anilox roll, i.e., a roll with a length of 3 m and a diameter of 250 mm, has up to 6 billion ink cells that have to be produced to close tolerances. In addition to offering complete systems for the coating of anilox rolls, Sulzer Metco also delivers the requisite high-purity chromi-

2 Coating of a 50t calender roll using the HVOF process Diamond Jet by the Sulzer Metco Coating Service.



**3** Image of the surface structure of an anilox roll taken using a scanning-electron microscope.



um oxide spray powder and has the necessary expertise to guarantee the highest possible process stability.

For customers who do not wish to invest in coating systems or who require peak-demand coverage, the Sulzer Metco Coating Service offers an attractive outsourcing solution.

### New Technology

A spray system was brought to market several years ago with the patented 3-cathode plasma gun Triplex II, which set new standards for performance and coating purity. Sulzer Metco is currently introducing a new 3-cathode gun under the name TriplexPro™-200,

which—together with an innovative power source TriStar IPS-1000™—offers greater flexibility and even higher productivity.

### Increased Performance, Longer Lifetime

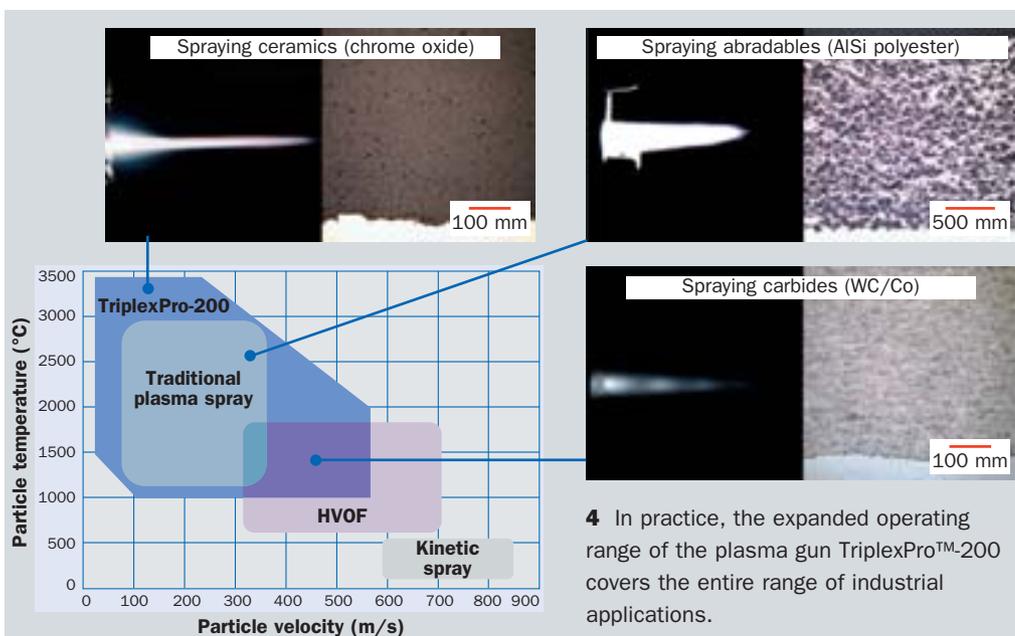
The TriplexPro-200 allows a throughput of material that is 2–3 times greater than that of conventional plasma guns and, depending on the spray powder, achieves a powder-deposit rate which is 10–60% higher. This product thus allows for a substantial reduction in both the consumption of material and the coating time. The average lifetime of the electrodes and nozzles used in the TriplexPro-200 is about 200 hours and is therefore significantly longer than in conventional plasma guns. In addition to the lower maintenance costs involved, a longer lifetime offers key technological advantages, since the lower level of wear on the nozzles and electrodes considerably reduces the risk of fine tungsten or copper particles penetrating the layer as visible contamination.

Such particles can cause screen imperfections during the subsequent laser treatment, which, as a rule, results in the rejection of the coating.

Both manufacturers of anilox rolls and printers can profit from Triplex technology. Anilox rolls can be coated more rapidly using less powder and with a lower risk of rejection, resulting in a more cost-effective process. In addition, the new technology achieves high and uniform layer hardness—at 1350 HV<sub>0.3</sub>, the surface is harder than glass—and thus increases the lifetime of the anilox rolls.

### Universal Application

Besides the above-mentioned benefits, the TriplexPro-200 offers an expanded process window in comparison with traditional plasma guns. This means that metallic or carbide coatings can be sprayed using the relatively cost-effective plasma process, while achieving a quality that was previously only possible using the HVOF process (Fig. 4).



**4** In practice, the expanded operating range of the plasma gun TriplexPro™-200 covers the entire range of industrial applications.

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