

New generation rollers for green printing

PRESS TECHNOLOGY. Under the Loto-Tec trade name, Westland Gummiwerke has recently begun to market a surface coating system that can be used to produce rollers with completely new properties—as our report explains in detail from a practical viewpoint.

The coating system is based on the use of fluorinated elastomers (FKM) and, through the combination of material and processing, it delivers three properties that set it apart from and in advance of the functionality and

Thirdly, the surface roughness of the coated rollers is significantly lower than that of traditionally polished rollers. In the Loto-Tec system, a roller that has been manufactured as normal and that is in prin-

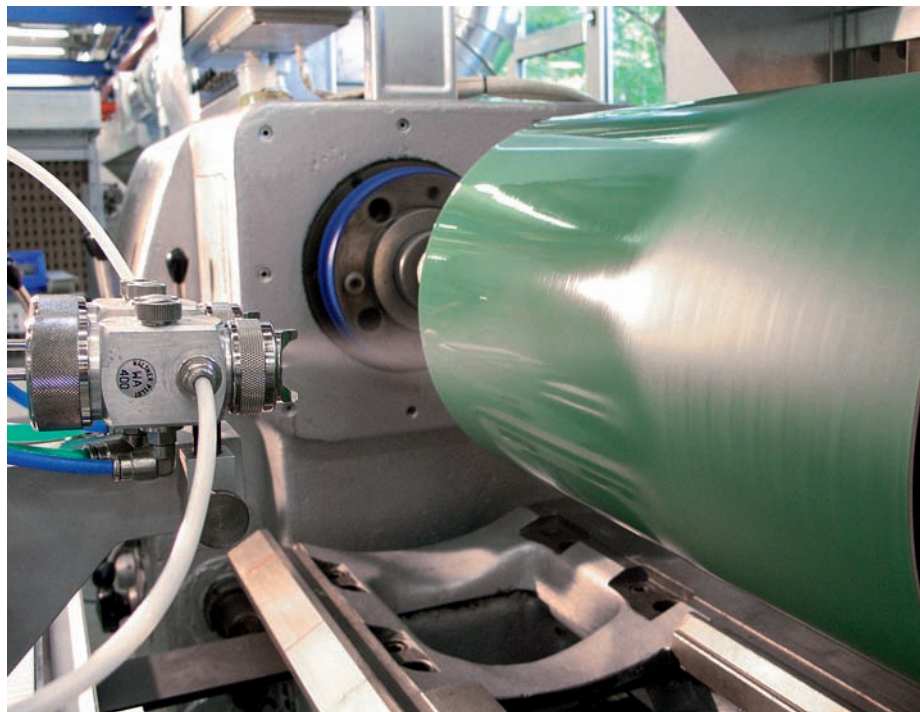


Figure 1: A functional elastomer roller is coated with liquid using the Loto-Tec system.

property spectrum of traditional elastomer rollers:

Firstly, fluorinated elastomers have a very low surface tension and products coated with fluorinated elastomers display a wetting behaviour that is similar to that of the familiar 'teflons'. In fact, chemically speaking, teflons and fluorinated elastomers are close relatives.

Fluorinated elastomers are high performance polymers and far exceed traditional nitrile butadiene rubber (NBR) roller materials in terms of their chemical, oxidation, ageing, extraction and temperature resistance.

principle ready for use receives a liquid coating in a similar way to the way a coating is laid down in printing, and this dries and cross-links to form a glossy, mirror smooth surface.

These three extreme properties of the coating system—water repellent, resistant and smooth—are of great significance in the offset process, in some circumstances individually, sometimes in pairs or sometimes all together.

Loto-Tec rollers make this process more efficient, more stable and by considerably reducing the consumption of organic solvents

and VOC emitters they help meet current health at work and environmental requirements.

THE ROOTS OF LOTO-TEC. The Loto-Tec roller underwent its baptism of fire as a damping unit fountain roller—a roller as water repellent as 'teflon' in a damping unit?! Doesn't everybody know that a fountain roller must be hydrophilic and have a reasonable carrying capacity?! Absolutely, but it needs to be explained why!

However, before going into this question, which is of general relevance to the industry, it is first of all necessary to recount a bit of the somewhat problematic history that has led to the use of the Loto-tec roller in damping units. In sheet-fed offset, in particular, the phenomenon of annular swellings on fountain rollers has been occurring for years. A brand new fountain roller comes into contact with press chemicals and there is an almost immediate, localized and radial swelling at the point of contact the first time ink runs back due to the setting or the motif. The swelling causes a higher pressure at this point, which, in turn, results in a thinner water film, and this then results in increased ink moving back up the train, further exacerbating the swollen ring. The end result of such a runaway process is the failure of the fountain roller.

ANNULAR SWELLING. In *Deutscher Drucker* 23/2006 Ulrich Schmitt of Fogra published a photograph of a print taken from the Fogra damping unit test forme that recorded a pattern of clean running that closely matched that of a plot of diameter against length for a fountain roller that had been the subject of complaint. This photograph is reproduced here as figure 2. In passing, it should be stated that the test sheet was not produced by the printer whence the roller came. The phenomena they exhibit are merely a good match. The phenomenon of annular swellings occurs worldwide and there is scarcely a damping solution that has not at some time exhibited this effect, although in some cases they have been on the market for decades with the same formulation without giving rise to comment. There has been no lack of investigations by Westland and the other companies involved in the market to try and understand and correct this effect. So far, however, nothing has succeeded and, therefore, in April 2008 a

working group of damping solution, ink and roller suppliers has been formed under the direction of Fogra with the aim of tracking down this phenomenon.

CHEMICAL RESISTANCE. In the mean time, however, complaints regarding ‘annular swelling’ were affecting over 20% of new installations, and this was accompanied by what for the press manufacturer and reseller was the tiresome fact that the customer and operator made a connection between payment in full for his or her new press and its flawless operation. In such a situation anything that helps is good, and everything that might help will be tried. In such a situation, water repellent Loto-Tec fountain rollers were tried out. They did and still do help. No operator who has complained about ‘annular swelling’ and who has begun to use Loto-Tec fountain rollers, has complained subsequently about this phenomenon.

The reason why the Loto-Tec roller behaves in this way is the high level of chemical resistance of fluorinated elastomers, which is much higher than that of NBRs and which prevents the entry and penetration of those

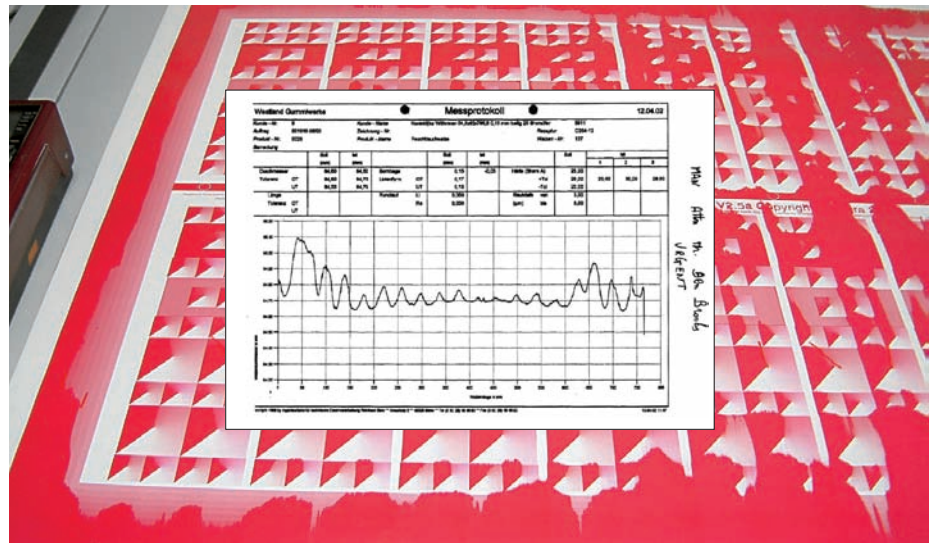


Figure 2: Sheet from the Fogra test form showing running behaviour from an article by Ulrich Schmitt in DD 23/2006 (page 64) and plot of diameter against length for a roller subject to complaint.

chemicals that cause the ‘annular swelling’. However, chemical resistance and volumetric and geometrical constancy are not the only features that hydrophobic Loto-Tec

rollers contribute to the damping unit. Another aspect of their ‘teflon-like’ behaviour is the ease with which they can be cleaned. Damping rollers need to be cleaned now and

then, and, just as the teflon coated pans of the housewife are easier to clean than traditional enamel ones, so Loto-Tec rollers minimize the cleaning required by the printer compared with traditional damping rollers. It makes a big difference if cleaning requires seconds rather than minutes. Very few printers would see this necessary cleaning work as being what they should really be devoting their time to. Reducing it significantly increases the availability of an eight colour press, for example, whilst cutting the consumption of organic sol-

The very smooth surface of the Loto-Tec roller means that the film of water leaving the nip is also very smooth and is free from structures of a rougher fountain roller and, above all, it is free from structures resulting from the splitting of the film. Any splitting—including splitting as conventional damping rollers move apart—is associated with the expenditure of energy, which leaves structures behind it in some form. The best known structure that originates from this is what is referred to as 'cording', which arises as the speed at which the film is split rises

fountain roller become apparent: no film splitting, therefore no splitting structures. No roller surface roughness, therefore no roughness in the water film. On the Westland test bench it has been found that the Weroaqua roller achieves clean running with 19 ml (per 100 mm of blade length and 10 minutes of blade time), whilst the Loto-Tec roller does so with 14 ml on a Speedmaster SM 52—in other words with 25% less water. This means that the water film generated by the Loto-Tec roller is more efficient, generating the same effect with a lower quantity. The less water required to achieve clean running, the less water runs back up the ink train. In consequence, the ink emulsion is dryer, more stable over the run, more resistant to ghosting, more secure against over-emulsifying and running ink, the ink dries faster and is more brilliant, and the printing window is wider. In addition, the less water that enters the ink train the less the salt burden that is left behind in it through evaporation, with the possible consequence of contaminating the ink roller surfaces and making them hydrophilic.

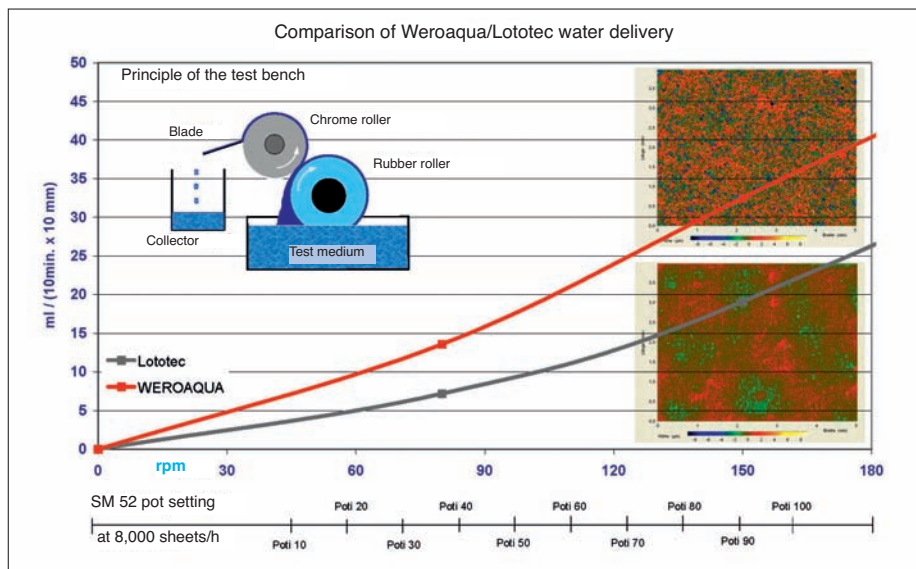


Figure 3: Water delivery by Weroaqua and Loto-Tec fountain rollers and their surface structure.

vents and cleaning materials. For these tasks, unfortunately, volatile cleaning agents have been used extensively and these are not good for man, press or environment. Their use now becomes completely superfluous.

DIFFERENTIATION. The most significant way in which the Loto-Tec roller sets itself apart is in its compatibility with IPA-free printing through the direct generation of a very smooth damping film. The teflon-like surface still picks water up 'mechanically' from the pan and delivers it to the nip but it does not penetrate the nip. The very low surface energy of 17×10^{-3} N/m is not sufficient to carry the water with it into the nip against a compression force of some 500 N/m and so the Loto-Tec roller leaves the nip almost dry and what water enters the nip is repelled by the hydrophobic surface and transferred to the hydrophilic chrome or ceramic surface. The Loto-Tec roller enters the nip with nothing and leaves with nothing. What water passes through the nip is exclusively carried in by and leaves with the hydrophilic duct roller.

and is the consequence of the competition between two hydrophilic roller surfaces for the water that has passed through the nip.

QUALITY OF THE WATER FILM. In the article, 'Damping rollers for IPA-free/reduced printing', in *Deutscher Drucker* 12/*30.3.2000, it was explained that the functionality of a fountain roller depends not on the quantity of water conveyed but primarily on the quality of the resulting water film. Using illustrations showing the water film from the standard Westland roller and the roller for IPA-free printing it was apparent in the former case that the water film displayed peaks and troughs along an axial direction, whereas the IPA-free roller produced a significantly smoother film. If a film of water displays peaks and troughs then the damping unit speed has to be high enough to deliver sufficient water in the troughs to ensure clean running, which means that there is already an 'excess' of water in the peaks. In essence this results in too small a window between clean running and water staining, and to problems during the run. It is here that the merits of the hydrophobic nature and the smoothness of the Loto-Tec

LOTO-TEC FOR IPA-FREE PRINTING.

Keeping the image-free areas on the plate clear is the only process stage that requires water. In all other areas, water disrupts and leads to process instability. In consequence, the Loto-Tec fountain roller is ideally suited to alcohol-free printing. A mirror smooth, teflon-like hydrophobic roller as the 'pan roller' in the damping unit appears to contradict everything that has been thought, written or said up until now. The surface of any roller currently used in the graphics sector is finished by polishing it, which leaves it, to a greater or lesser degree, rough. The surface of any roller used in the graphics sector is, to a greater or lesser degree, hydrophilic and water wettable. These circumstances are a classic case of how pre-judgements come to be made. Because there are no other kinds of rollers, it is only with such rough, hydrophilic rollers that the process will function. Loto-Tec exhibits properties that elastomer rollers simply did not possess previously and the result is that from every viewpoint the process runs more stably and better.

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