Supercalenders are multi-nip calenders that are always installed offline, are designed for high rotational speeds and are used for the supercalendering of paper.

Improving calendering quality

Papers are calendered in order to improve their surface properties and facilitate finishing. Problems that arise with the web lead system during the process can be prevented through the use of spreader rolls.

The process

Calendering processes refine the surface of papers so make them easier to print and give them an improved gloss. During the course of such a process the paper is subjected to conditions of extreme stress. High temperatures and pressures compress the fibres to a high degree. This causes the width of certain types of paper to change; the cross-sectional thickness profile tapers off, especially towards the edges. Once it exits the nip, the paper web reacts as it relaxes from the stresses. In so doing, the edges curl and draw tight. The result is an “unevenly” running paper web that becomes apparent in the form of “fluttering” and which can, under extreme conditions, cause folds to form. The upstream roll must then rectify this condition. There are various solutions for overcoming this problem, depending upon the types of calender in use.

Different calender systems

In a supercalender or Janus calender, the winding angle is approx. 180°. The greatest stress and change for the paper is caused between the first and second calender rolls. A spreader roll of curved design, in combination with a deflecting roll, is normally fitted at this position. In the further course of the process so-called unirolls (supercalender) or CFRP rolls (Janus calender) are used.

Author: Armando Giovannelli, Lüraflex, Neuss

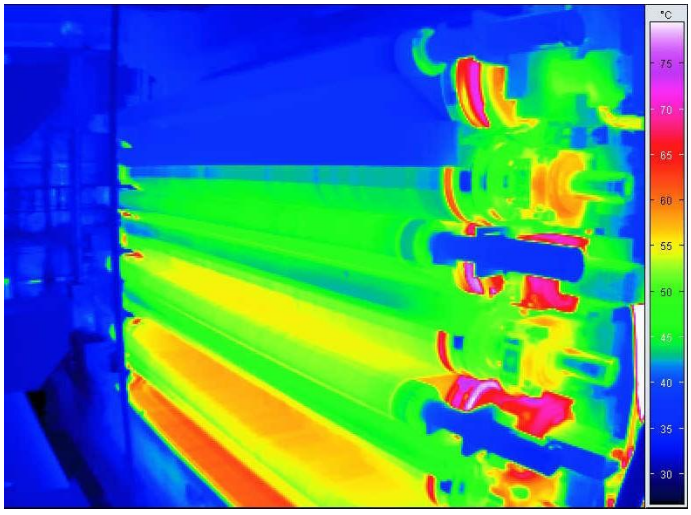

Fig. 1: Thermographic image of a uniroll in a supercalender

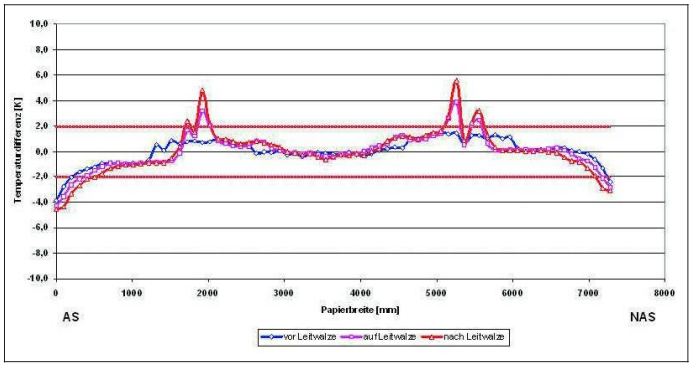

Fig. 2: Temperature graph for a uniroll with "devil's ears" on a supercalender with a 3-section guide roll for SC papers

In a supercalender, unirolls can cause glossy or moist stripes as a result of overheating of their internal bearings. This effect is commonly known as “devil’s ears” – undesired peaks in the temperature or gloss profile. (Figs. 1, 2, 3).

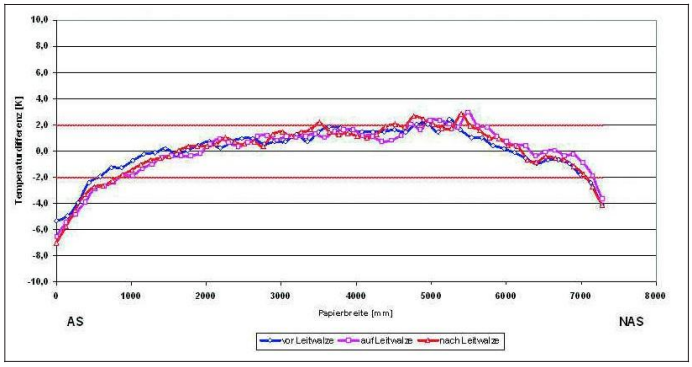

Fig. 3: Temperature graph for a Lüraflex spreader roll on a supercalender for SC papers

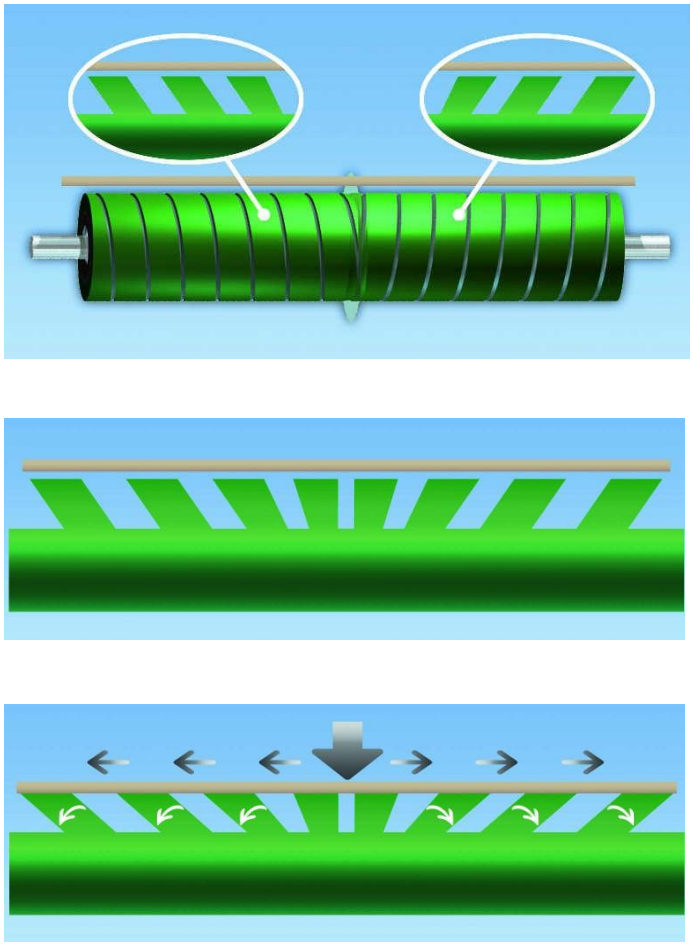

Fig. 4, 5, 6: The working principle of a Lüraflex spreader roll

On a 3-roll soft calender, one situation is similar to that on a Janus calender: the winding angle is 180°. On a 2-roll soft calender or EcoSoft calender the output wrap angle is variable. Normally it is relatively small, ranging from practically tangential to up to 90°.

Defining the problem

In practice, the surface of the paper is inspected following a calendering process. A smooth and even path for the material is a requirement for taking correct online measurements.

Paper manufacturers need a solution that is capable of eliminating the partially uneven sections and minor folds in the paper. The requirement for this is a cylindrical roll that allows the material to lie across its full width, thereby avoiding partial overstretching. An elastic, flexible and slightly yielding surface would be the ideal situation.

The solution

Since the beginning of 2000 the use of spreader rolls and Sensomat rolls has allowed many projects to be successfully concluded in the calendering sector.

Spreader rolls

The experience of many paper manufacturers using different calendering systems in various plants indicates that Lüraflex spreader rolls fulfil the stated requirements.

The Lüraflex system can be used at wrap angles of up to 180°. The rubber quality is selected in accordance with the process parameters and impending application.

Because of the undercut profile and active surface (wrap angle), the profile webs act like small spring assemblies by absorbing the uneven running of the paper. Folds are simultaneously stretched out. The result is a smooth and even material path. (Fig. 4, 5, 6).

Sensomat rolls

A Sensomat roll is the final roll upstream of the winding roll of a supercalender. Its purpose is to “press out” the air from the paper reel that becomes entrapped as a result of the paper-making process, or more accurately to “control” it. In the case of paper that is impermeable to air, this is extremely difficult to achieve. Having a “controlled” amount of air in the paper reel is actually advantageous, because it balances out differences in the thickness of the paper. The surface profile and hardness of the rubber of the Sensomat roll play a key role here. The correct roll design is thus able to prevent the formation of “air roundels, tank tracks and even marks on the paper”. Smoothing the paper results in a significantly better winding quality, which has a very positive effect on the finishing process?

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