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Research area: Process aims

Paper and paperboard production // Surface treatment

Key words:

Curtain Coater, heel zone, pigments

Title: Identifying the influence of pigments on the process at the heel of curtain impingement in a curtain coater

Background/Problem area

Titanium dioxide is used during paperboard coating to improve the coverage of the often dark baseboard. The refractive index of titanium dioxide provides good coverage. Because of the high pigment prices, papermakers are trying to reduce the amount of titanium dioxide as far as possible. Titanium dioxide extenders like calcined clay are frequently used for this purpose. The more uniform the thickness of the coating is the better is the coverage of the base paper surface. So-called contour coatings achievable by means of curtain coating technology, for example, are highly advantageous in this respect. With an ideal contour coating, it should even be possible to partly or even completely replace titanium dioxide by less expensive pigments.

Currently installed curtain coaters are mainly used to produce carbonless copy papers and thermal papers. Graphic papers have been curtain coated only in pilot trials so far. However, the basic advantages of the curtain coater are so obvious for these papers that trials are underway to investigate the commercial use of this coating technology for mass paper production. Prerequisite for this is an improved control of the processes occurring when the curtain is impinging onto the web, and an enhanced and optimised operating window of curtain coating technology.

Objectives/Research results

Main aim of this research project was the determination and enlargement of the operating window at the heel of curtain impingement in the curtain coater. Ideal coatings make it possible to achieve an ideal coverage of the paperboard surface enabling the partial or even complete replacement of titanium dioxide. The influence of pigments on the processes at the impingement point will be identified by varying the pigment systems.

To achieve this aim, a laboratory curtain coater head was installed in a laboratory coating unit. A laser beam is projected onto the impingement zone of the curtain and monitored by a camera system to evaluate the processes at the heel of curtain impingement. The heel quality is evaluated by assessing the camera pictures.

The laboratory trials as well as the pilot trials have shown that next to the Reynolds' number also parameters, e.g. coater speed, geometry of the coating aggregate and colour scheme are significant for the formation of a heel.

There is only a formation of a heel if the following points are achieved:

- the speed must be in a lower range (under 300m/min) – but by now this range is in the area of board coating unusual or rather in speciality applica-tions usual
- if the dynamic viscosity is considerable under 50mPas and/or the solid content very low (<<60%) which is in the case of special coatings possible but not usual in paper- and board coating
- if the flow rate is very high, i.e. coat weights >>60g/m² which are by now unusual in the paper- and board coating
- a formation of a heel will be supported through a curtain height >>175mm and/or a changed curtain position (against the machine direction, i.e. from 12 o'clock to 11 o'clock)

The uses of calcium carbonates maintain to a considerable faster formation of a heel – mixtures of calcium carbonate and calcinated clay maintain to a considerable more stable process.

Depending on the application it is possible to replace titan dioxide partly or even fully.

The project has been concluded successfully.

Application/Economic benefits

Europe's annual production of coated paper and board amounts to approx. 25 million tons. In future, at least three manufacturing plants will be built or retrofitted per year to install new coating processes in Europe, and there will be further plants in the field of specialty paper production. If curtain coating technology prevails over other methods, there will be numerous R&D activities of papermakers and raw material suppliers in this area. Particularly SME having no large R&D departments of their own will benefit from the results of this research project. They can gain economic and qualitative advantages from the use of the new coating technology.

Besides information about the enlargement of the curtain coater's operating window, the research project also provides hints about the paper and board quality achievable by this coating technology. Board makers which are currently not upgrading their products but are under competitive pressure to look for a possibility to enhance their board quality are given good reasons to install a curtain coater. This benefits not only the manufacturers of coating units but also a wide range of SME commissioned for its planning, maintenance and service as well as for the development of necessary infrastructures.

Project period: 01.12.2007 – 28.02.2010

Remarks

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