

Selection and optimisation of a Yankee coating system for improved machine performance

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Technical considerations of coating formation

There are many occasions when machine operators say that the Yankee coating formation is uneven.

So It's probably a good idea at this stage to discuss all the factors which may affect the performance of the coating.

Yankee coatings are generally composed of two three or even four components; adhesives, modifiers and release agents.

Many other process chemicals and the furnish contribute.

Technical considerations of coating formation

A number of tissue manufacturers use a second inorganic modifier as a protective coating for the cylinder.

The surface of a cast Iron Yankee can be modified.

Some modifiers are often misused as they will not form inorganic complexes when applied to a “metalized” surface.

They only modify the coating adhesive and at best form a protective film.

Technical considerations of coating formation

Adhesives are used to hold the sheet against the Yankee during the drying and creping process.

They are either natural or synthetic polymers from the furnish.

Wet end chemicals being used to give a properties such as wet strength, dry strength and stickies control.

If the coating adhesive is not modified or mixed with a release agent it will become hardened onto the Yankee surface and may even result in increased blade wear on the edges outside of the sheet. “Edge buildup” is considered a serious problem.

Operators preferring to see a softer coating being removed on the edge rather than a hard edge build up some mills use edge showers to help control edge buildup; however, in many mills even edge showers have limited success.

Edge build up, chatter and excessive release

Edge build is often associated with sheet breaks or heavy blade wear.

This will eventually cause chatter marks in the coating leading to:-

damage of the cylinder surface.

a poor tissue structure with many defects

holes in the sheet.

Many forms of “release agents” soften and

slow down the setting of the coating or even

wash off the coating altogether, such as

de-foamers, softeners and surfactants.

Excessive release removes all the coating from

the cylinder

It may look shiny and reflective not opaque

Minimal surface protection and therefore

open to damage by the doctor blades.



Reasons for Coating removal

- The worst case for coating removal is when excess water is carried into the nip by moisture streaks in the felt.
- The moisture streaks in the felt may be the result of
 - fibres carry over
 - felt plugging from contaminants
 - water sprays being applied to the felt

Yankee coating solutions

- Select a Yankee coating which is tolerant of moisture and heat variations.
- A combination coating package which allows creping and cleaning doctor blades to remain lubricated during the production process to maximize blade life.

The role of the coating modifier

The role of the modifier is to generate a softer and modified coating, which will not be removed or washed off so readily when rewetting occurs at the nip.

Felt moisture streaks are the most common reason for coating wash off.

Creating a more flexible coating gives the following benefits:-

- a finer crepe structure with improved sheet softness.

- good sheet breakdown with improved bulk

- more natural lubrication during the creping process to improve blade life.

When a softer modified coating is NOT used changing to high bevel or ceramic blades can actually remove more hardened residual coating and reduce blade life or even Yankee wear.

Practical solutions to prevent coating removal

Examination of the wet end can improve the conditions for a good coating dramatically by evening the cross direction and machine direction water removal as much as possible.



Often during a machine survey it can be seen that the machine is set up in such a way that fibre is able to spray outside of catch trays and carry forward with the wire as shown.

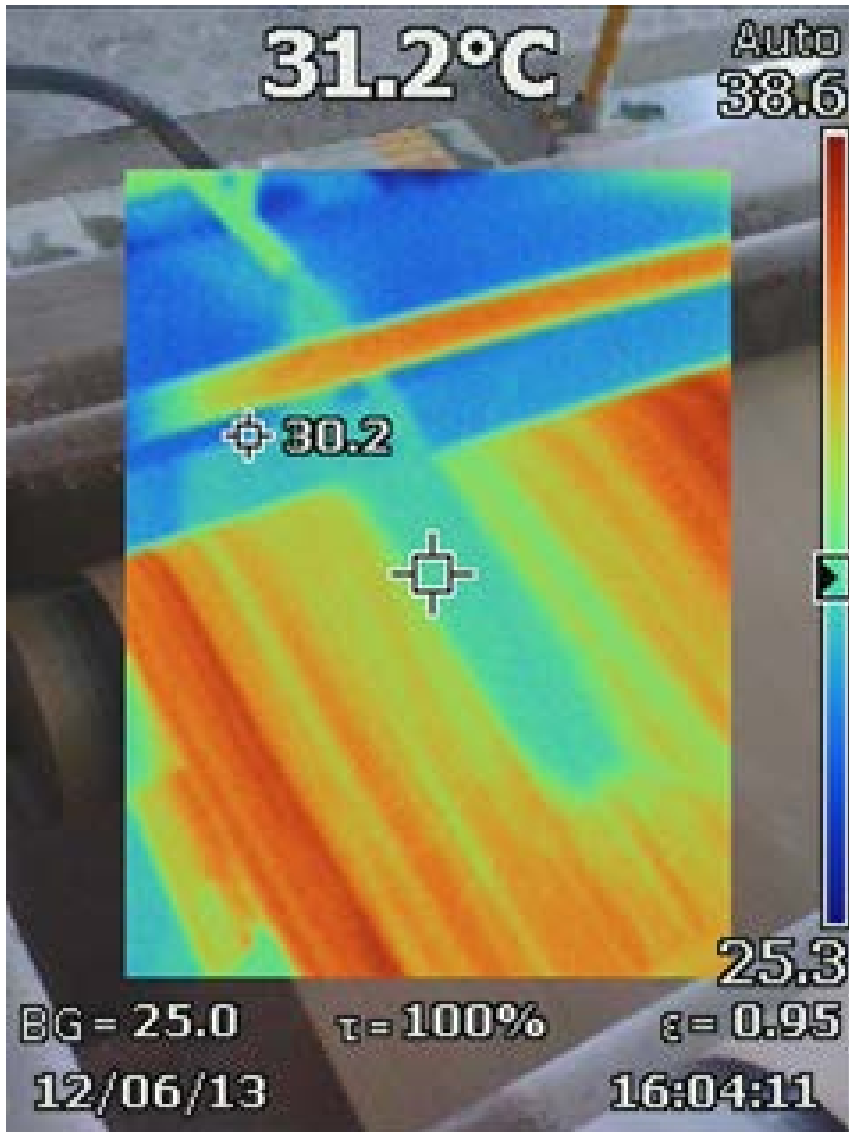
Minimize fibre build up to prevent coating removal

Fibre is then capable of finding its way onto felt guide rolls through mechanical transfer or felt spraying and vacuum systems.



Fibre slowly plugs the felt in localized places causing poor dewatering and excess rewetting at the nip in the areas affected. The Yankee coating is washed off only in the high moisture areas leading to a streaky coating.

Water shower compensation to prevent fibre build up



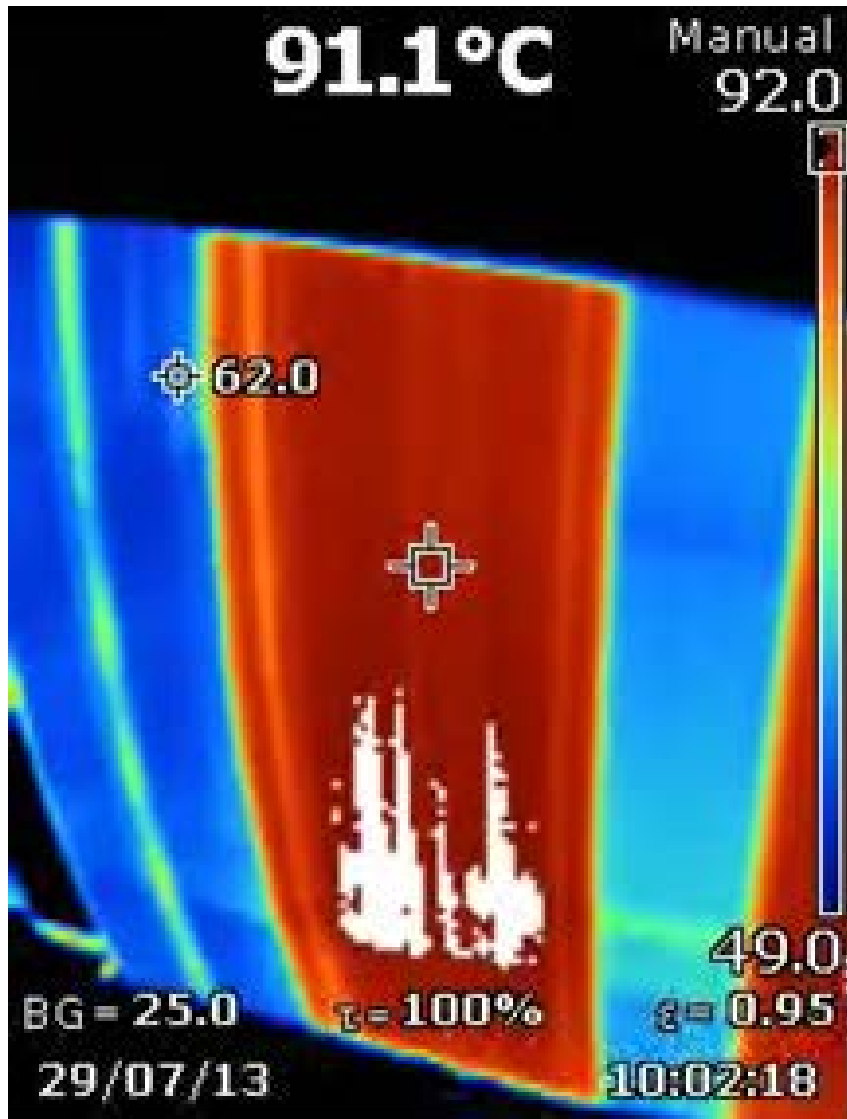
To compensate mills will often use water sprays to try and keep the fibre content down or to even the moisture across the felt.

This practice makes coating wash off worse. It gives the felt a temperature shock Induces contamination from stickies resulting in reduced felt life.

In this combined Infra-red and visible image, we see a black water hose being applied to a felt. The temperature scale down the right hand side of the image indicates the felt temperature is normally 36-37 °C degrees centigrade;

The water hose reduces this to about 31 °C . The resulting lower temperature of the felt will change the dewatering rate at this position, This reduced moisture effect clearly works in reverse and the lower temperature water being carried into the nip also increases the evaporative load

A thermal image of the Yankee surface



Taking a thermal image of the Yankee surface if accessible can reveal more about the condition of the condensate removal system

If the coating is being applied uniformly then is the coating subject to “wash off” because of a wet streak in the felt?
Is the condensate removal system working evenly across the whole surface or maybe some of the syphons are restricted?
Is the sheet outside the Yankee operating width, and therefore running with hotter edges or Is the felt being re-wetted on the edges because of the hotter Yankee edges ?

A video of the surface can indicate how many steam distribution systems are set up correctly and if all syphon straws are affected in one area. Dampers in the hood may be being used to compensate for other problems?

Note ; The red band indicates good heat transfer while the blue bands show poor condensate removal or cooling from wet felt streaks.

Summary

The selection and optimization of a Yankee coating system to provide a modified or softer coating should be considered when;

- Wet end chemical additives are causing too much natural adhesion
- High levels of filler are acting as an abrasive and leading to blade wear.
- High bevel or ceramic type blades remove the majority of residual hard coating from the Yankee surface despite increasing the add on amount, and leave the surface unprotected
- The mill is using high levels of acacia pulp in the furnish; above 50% causing high release levels due to the waxy nature of the extractives.
- There are significant moisture streaks in the press felt from
- Poor felt conditioning, Incorrect crown/ bad pressing, contamination such as stickies, wet strength or filler, or even felt age.
- The Yankee surface temperature is uneven

Case history 1: Improving blade life

A mill in North East Asia was experiencing problems with reduced blade life.

The mill objective was to change to a softer coating package to achieve a reasonable blade life from the doctor blade.

The conventional coating system might not have enough tolerance to the aggressive doctoring capability of the blade.

The mill was using a tungsten carbide (ceramic type 90 degree blade), but was only achieving an average life of 10-15 hours, although when the mill first changed to this blade they achieved up to 3 days life from each blade.

Case history 1: Improving blade life

Amazon-Papyrus worked with the mill to identify other areas that could improve the performance of the coating system by reducing wet end effects on the coating.

Changing the coating from a conventional hard adhesive system with a modifier to a softer modified Yankee coating package from Amazon the mill were able to increase the tungsten carbide blade life from 16-24 hours to 100 hours. Relatively a ceramic type blade should have 10 to 20 times more life than a steel blade.

Optimization with this improved coating package set a new blade life standard of changing the blade after a minimum of six days or about 144 to 150 hours.

Case history 2: Improving durability of the coating

A mill in South East Asia was still having trouble achieving an even coating on the dryer; a number of areas in the cross machine direction had an uneven temperature profile. This was due largely to mechanical and heat transfer difficulties within the Yankee casting. Amazon-Papyrus worked with the mill to find a suitable coating that was more forgiving to the operating conditions and capable of producing good quality tissue using both virgin and recycled furnishes.

Case history 2: Improving durability of the coating

A machine evaluation led to replacing a combination of a semi hard coating and softer coating applied at an addition rate of 1.4 mg/m^2 with a modified coating and an oil-based release agent.

This modified coating allowed the mill to:-

- Increase their machine speed to a new record level.

- Improve softness and reduce the feed rate of the adhesive to 1.02 mg/m^2 (as actives).

- while in addition the blade life was maintained.

Conclusion

The use of modified softer coatings, allows the tissue maker the flexibility of being able to meet their individual needs.

Improved softness, coating stability and reduced hard coating build up.

They also offer solutions to difficult operating conditions which may normally cause the Yankee coating to be washed off during rewetting by the felt.

Moreover, modified coatings give the papermaker the flexibility to maximize the doctor blade life and thus increase productivity.



Thank You

