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Dryer fabric cleaning

Scope

This Technical Information Paper lists and briefly describes various methods for cleaning dryer fabrics.

Dryer fabric contamination

Contamination of dryer fabrics leads to loss of air permeability and can reduce the effectiveness of pocket ventilation systems, reducing drying capacity. Fabric filling is rarely uniform, and may contribute to non-uniformity in paper moisture. On some machines, a change in fabric permeability can cause problems with sheet runnability. Operation of transfer boxes, blow boxes, and ventilation ducts is affected by the openness of the fabric. Dryer fabric contamination may lead to sheet quality problems such as fiber picking and holes in the sheet. The type and frequency of fabric cleaning can have a significant effect on machine efficiency and life of the dryer fabrics.

Safety precautions

Use eye protection and protective clothing when using chemical cleaners, hot water solutions, pressurized air, or any other situation where one might come into contact with high velocity, thermal, or chemical hazards. Be particularly aware of high temperatures, roll-fabric nips, tail threading ropes, high pressure shower sprays, and slippery floors when working in the dryer section. Mill safety procedures, including fall protection, must be followed. During cleanups, avoid spraying water on hot dryer cans to prevent thermal shock, damage, and potential injuries.

Dislodged and “picked” materials need to be collected in savealls and removed or blown out of hoods to minimize the potential for hood fires.

Background

Dryer fabrics in a paper machine convey the web in a stable manner through the dryer section. They provide effective and uniform contact between the web and dryers to enhance drying performance, improve runnability, and restrain the web from shrinkage-induced defects in the paper.

Fabric tension presses the paper against dryer surfaces to improve thermal contact and increase drying rate. Fabric tension also serves to restrain the paper web during drying, reducing the amount of web shrinkage and the resulting variation in web physical properties across the width of the web.

Good fabric permeability improves the effectiveness of pocket ventilating devices such as ventilating rolls and ducts, and can increase the drying rate. Fabric permeability also determines the amount of air entrained by the fabric, affecting web stability. In single fabric runs, fabric permeability is critical to the correct operation of stabilizing blow boxes and vacuum rolls.

Dryer fabric contamination reduces permeability and consequently the effectiveness of pocket ventilating and sheet stabilizing devices such as blow boxes, degrading drying performance and runnability. Sheet-side

contamination can lead to quality defects since surface contaminants can pick fibers out of the paper, or cause holes and web breaks. Black spots may appear in the finished product if these contaminants are picked up by the sheet. Fabric cleaning is particularly important in the warm-up zone of dryer sections. As the sheet heats up, contaminants can be either deposited onto the fabric or rolls, or are set into the sheet.

In order to remain effective, fabrics must be regularly cleaned and conditioned, permeability level and uniformity must be maintained, and surface contaminants and residual fabric moisture from the cleaning system must be removed.

Fabric construction

Dryer fabric construction and material selection are based on specific machine requirements. Dryer fabrics are woven or assembled from coils (spiral fabrics) and are provided with a pin or coil seam for installation.

The majority of dryer fabric yarns are monofilament, although multifilament materials are used occasionally, the most common use for multifilament yarns being for permeability control.

Most dryer fabrics, regardless of type, are made of 100% synthetic materials. The most common material used is polyethylene terephthalate or PET, commonly called polyester. At high temperature and in the presence of water, PET can hydrolyze. This causes the deterioration of fabric properties. For dryer fabric applications, a hydrolysis stabilizer is added to PET to delay the onset of hydrolytic degradation.

Other materials suitable for dryer fabrics include acid-modified polycyclohexamethylene terephthalate, PCTA for short, and poly phenylene sulfide, or PPS, both which are more hydrolysis resistant.

Common materials used for multifilament yarns include polyester, acrylic, Nylon and Nomex (extremely heat resistant).

Cleaning contaminants

Contaminants found in dryer fabrics include papermaking additives, coating binders, fiber, and other organic contaminants (pitch, oil, and stickies including various types of adhesives). Typically, a mixture of cellulosic fiber, inorganic fillers, and these materials are bound together on a dryer fabric.

Table 1 lists sources of common contaminants. The quantity and type of contaminants vary depending upon paper grade, dryer operating conditions, and fabric type. Hydrophobic materials (pitch, latex, oil, and grease) have the strongest affinity to the fabric surface. With the expanding use of secondary fibers, contaminants such as stickies, hot melts, and plastics are becoming more common. Identifying the exact nature of the contaminants helps determine the proper cleaning method.

Table 1. Dryer fabric contaminants

<i>Papermaking Additives</i>	<i>Coating Binders</i>	<i>Other Organic Contaminants</i>	<i>Fiber and Fillers</i>
Rosin size	Latexes, e.g.	Pitch	Calcium Carbonate
ASA size	SBR	Oil, grease	Clay
AKD size	PVAC	Waxes	TiO ₂
Wet strength resin	Starch	Plastics	Cellulosic Fibers
Alum		Hot melts	Cellulosic Fines
PAC		Stickies	Talc
Starch			

Cleaning methods

Several methods are used for cleaning dryer fabrics, but no single device is best for all machines or fabric positions. A combination of cleaning methods might be the best approach, which is learned by experience of the equipment vendor and mill operating personnel. The best type of cleaning system depends on the type of fabric contaminants. This section outlines the most common methods of fabric cleaning and offers some basic guidelines for their application.