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A guide to proper wipe roll selection for the corrugated box industry

Scope

The wipe roll in flexographic printing is a critical component for quality printing. The areas that are of most concern for quality printing when using a wipe roll are: 1) the compound in which the wipe roll cover is manufactured; 2) hardness of the wipe roll compound; 3) concentricity and precision of the wipe roll.

Safety precautions

No safety precautions are applicable.

Content

The wipe roll cover can be manufactured in either polyurethane elastomer compounds or rubber elastomer compounds. Polyurethane elastomers have very different properties from rubber elastomers. Polyurethanes can either be processed in liquid form (known as castable polyurethane), or as a rubber known as millable gum. The liquid polyurethanes have superior properties. Since the polyurethane is a liquid, it can be screened many times to ensure that the roll cover is free of foreign materials and homogenous throughout the roll surface. Because they are micro screened, polyurethane materials will not contain foreign materials that may cause premature anilox roll wear. The liquid polyurethanes have two different types of chemical backbones: polyester or polyether. The polyester polyurethane is the superior backbone for wipe roll applications, having outstanding abrasion, cut and chemical resistance. The toughness and durability of the polyester polyurethane makes it less susceptible to damage.

Rubber elastomer compounds acquire their properties by compounding synthetic rubber with many types of reinforcing materials. Rubber compounds are available in many different types. The most commonly used synthetic rubbers for wipe rolls are neoprene and nitrile (Buna-N).

Rubber elastomers are either extruded or wrapped on the wire roll core. The extrusion process is the most modern and commonly used one. In this manufacturing process a band of rubber material is extruded and wrapped across the face of the roll to a desired thickness. The covered roll is then placed in a vulcanizer and cured. Extrusion lines are the weak areas of rubber elastomer roll covers; they can split and tear and can also result in changes in uniformity of transfer to the anilox roll causing ink streaks.

Rubber compounds are manufactured with coarse fillers which can cause wear in the anilox roll. Micro screening of rubber in the extrusion process is very difficult due to its plastic nature. Coarse screens are used which

TIP Category: Automatically Periodically Reviewed (Ten-year review)

allow foreign particles to be included in the cover. These coarse particles could scratch the anilox roll or cause improper ink transfer to it.

Buna-N has poor ozone resistance and can harden with time. Neoprene has better ozone resistance but changes hardness with time.

Wipe roll hardness is very critical to the operations of quality flexographic printing. Hardness is generally measured on a Shore "A" durometer scale. A durometer that is consistent for the life of the roll will provide the print station with even nip pressure. Durometer consistency is directly related to the type of material that is used in the manufacture of the wipe roll. Rubber elastomers have a tendency to soften or harden with use. In a wipe roll application the ozone, along with the inks, will cause the rubber roll to soften or harden with age. Cast polyurethane wipe rolls are not affected by either printing inks or the ozone.

Wipe roll hardness has evolved along with changes in anilox roll design and composition. A wipe roll that used to be specified 50/55 durometer is now specified at 70/75. A softer roll will create a wider nip between these rolls and the anilox rolls. A wide nip between these rolls makes it difficult to control ink volume. A harder wipe roll will create a narrow nip which produces more pressure between the wipe roll and anilox roll. This even nip pressure allows for more precise ink control. Elastic modulus is another property of rubber and polyurethane compounds which is very important in maintaining a uniform nip. Polyurethane compounds compared to rubber compounds at a given hardness have a higher elastic modulus. This means that the polyurethane cover will distort less under load. It has less of a tendency to flatten out and it will maintain its elastic modulus for a longer period of time.

The proper selection of the wipe roll cover is very important, but the physical tolerances of the finished product are just as critical. A wipe roll designed to be a precision instrument must be finished and ground to O.E.M. tolerances. The wipe roll finish must be free of blemishes and grind marks or scratches. This is called a class one polished finish. The diameter must be ground to O.E.M. specifications, T.I.R. (Total Indicator Runout) should be within 0.002 inches (0.051 mm). The roll face should be parallel within 0.002 inches (0.051 mm). The bearing surface should be within O.E.M. specifications, and the cover must be concentric to the bearing surface within 0.002 inches (0.051 mm). The finished roll should be checked on bearings for concentricity. The diameter and straightness should be checked with a PI tape that is graduated in thousandths of an inch. Micrometers should not be used for checking diameter as it is very difficult to reproduce inspection readings from one person to the next. Micrometer readings on a 70/75 durometer roll will vary greatly from person to person.

Installation of a wipe roll with removable journals requires extra care. The wipe roll with removable journals is grounded on grinding journals in the roll covering shop. The installer must ensure that the running journals are positioned so that the wipe roll runs within 0.002 inches (0.051 mm) T.I.R. The roll should be checked in the press with the dial indicator and if the roll is running out of tolerance, the bolts in the journals will have to be loosened and the journals repositioned to achieve 0.002 inches (0.051 mm) or less runout.

Customer demand for higher quality graphics can be achieved with the proper wipe roll selection. Whether it is used with a laser or a mechanical engraved anilox roll; a precision ground wipe roll with the proper compound in 70/75 durometer range will help the corrugated box industry attain the higher quality graphics it requires.

Keywords

Flexography, Printing, Selection

Additional information

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