Straight Talk on Parts

Topic: Recoated Fuser Rollers

Revised February 1997

Q Some companies offer recoated ("remanufactured") fuser rollers at extremely low prices. Are there quality sacrifices, potential performance problems, or other risks a distributor or dealer considering these products should be aware of?

A ***Yes.*** As with many other extremely low-price products, there are significant product quality and performance risks associated with purchasing recoated fuser rollers. Despite the claims of various recoating companies – who commonly, and misleadingly, refer to their products as "remanufactured" rollers – these **risks include serious, recurring fuser roller performance problems, including frequent paper wrinkling, jams, and/or skew, as well as inconsistent fusing and catastrophic failure. Such problems can lead to costly emergency service calls and serious end-user dissatisfaction.**

Although *it is possible* to strip and recoat used fuser rollers to provide OEM-equivalent performance, most of today's recoaters either don't have the capabilities, or don't follow the procedures, necessary to do so consistently. For example, most recoaters accept – and proceed to recoat and sell – used fuser rollers that are too damaged and/or out of specification to be recoated properly for effective performance. Thoroughly inspecting all used fuser rollers returned, and conducting additional quality inspections after each phase of the stripping/recoating process, would result in a substantial "fallout" rate and significantly increased costs. If these steps were performed, the finished products could somewhat more accurately be called "remanufactured." However, *the vast majority of recoaters do not perform these steps.* Why? Because the resultant increased labor costs and substantially reduced production yields would significantly increase recoated roller costs, and could consequently make recoating operations economically unfeasible.

Let's consider some of the specific problems with recoated fuser rollers and typical recoating processes, along with their potential adverse effects on paper handling, fusing, and overall machine performance.

1. During removal from machines, temporary storage, and shipping (often without sufficiently protective packaging), used fuser rollers commonly incur damaged gear slots, damaged or weakened end journals, and severe scratches or dents *(see Figures 1 - 3 on next page)*. **Although such defects can lead to performance problems ranging from frequent paper jams and poor fusing to parts seizure resulting in catastrophic fuser station failure, recoaters generally don't take the steps or have the sophisticated equipment necessary to detect**

Figure 1. Although this used fuser roller looks as though it could be recoated to provide satisfactory performance, closer inspection will reveal otherwise.

Figure 2. "Picker finger bands" show physical damage penetrating all the way through the fluoropolymer coating and into the aluminum insert. *Recoating over this type of damage can result in copy quality problems and premature fuser roller failure.* End journal surface abrasion is also visible.

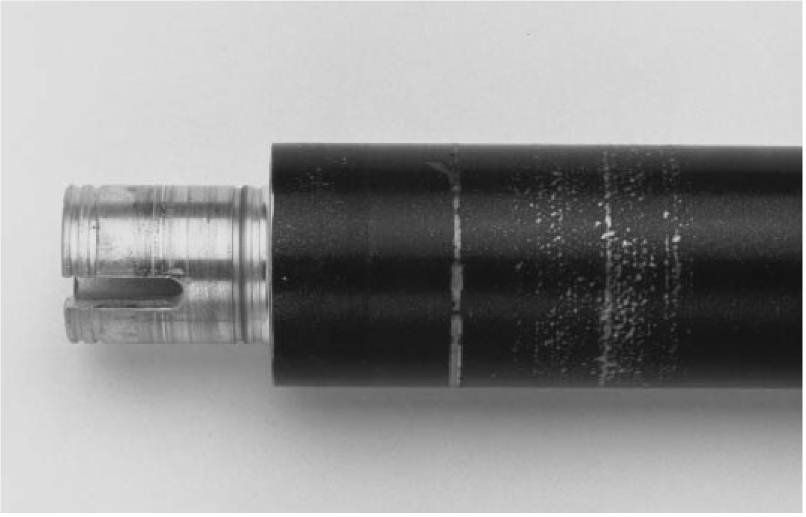
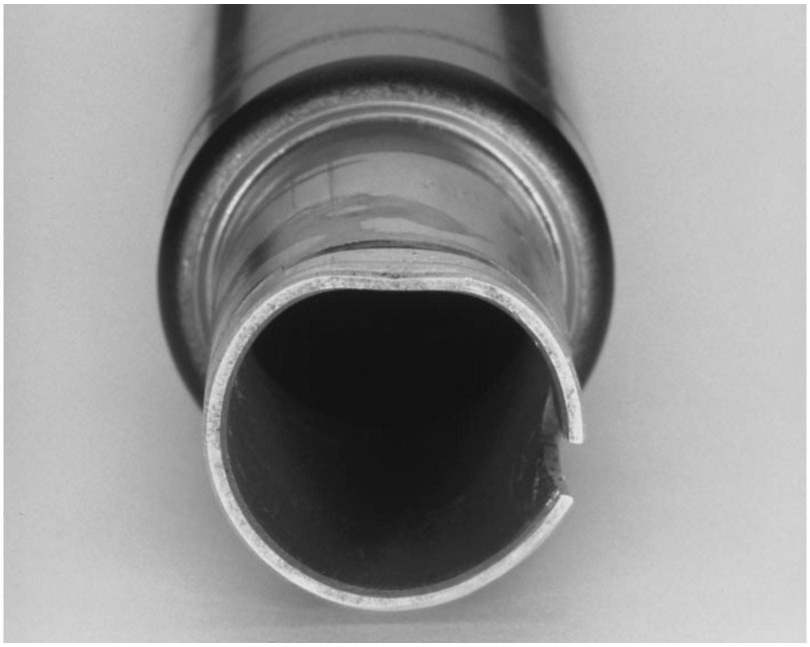


Figure 3. In addition to exhibiting surface abrasion sufficient to cause performance problems, the end journal on this used fuser roller is severely dented and "out-of-round*." This type of physical damage to end journals frequently causes premature bearing seizure, which can result in catastrophic damage to the fuser station and related parts.*



or repair them. Consequently, used fuser rollers too damaged and/or out-of-specification for successful recoating frequently make their way back into machines in the field, where they can create costly service problems for distributors/dealers.

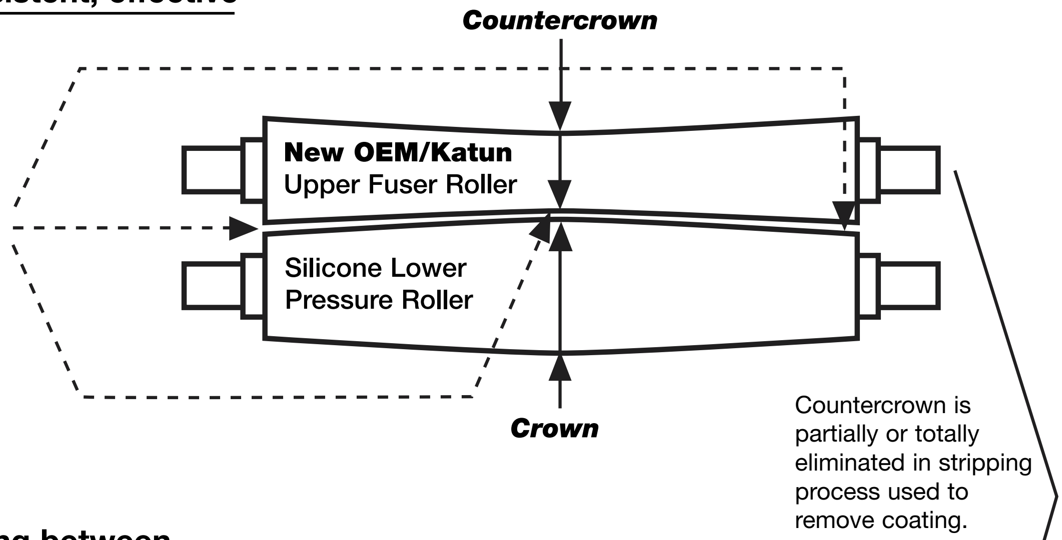
In addition, various aspects of the recoating process itself can damage grooves, screw holes, and/or drive gear slots on end journals, adversely affecting the recoated fuser roller's engagement with other machine parts. Excessive "play" between these fuser station parts can cause frequent paper jams, excessive noise during machine operation, or even catastrophic damage within the fuser station.

2. "Stripping" processes used for removal of the original fluoropolymer coating often change critical dimensions and other characteristics of a used fuser roller, taking it out of specification to an extent that can cause serious performance problems with the recoated fuser roller. For example, virtually all high-quality upper fuser rollers are engineered and manufactured with a precisely specified, *concave* surface curvature called a "**countercrown**," in addition to meeting exact specifications for their outer dimensions. The countercrown – essential for proper mating with the surface of a silicone lower pressure roller that has a *convex* surface called a "**crown**" – is often partially or totally eliminated by a straight lathe cut used in the recoater's stripping process. (**NOTE:** Some recoaters use a straight lathe cut to remove defects that remain in the surface of the aluminum insert *after* another stripping process, such as sand- or grit-blasting.) The resultant improper "mating" between the upper and lower rollers can cause problems such as frequent paper wrinkling, jams, and skew *(see Figure 4 on next page)*, as well as poor/inconsistent toner fusing *(see Figure 5 on page 5)* – especially when running larger-size papers.

Partial or complete elimination of the countercrown during this type of stripping process also results in reduction of the upper fuser roller's outer diameter, especially near its ends. The area of mating between the upper and lower rollers – called the *nip* – which is critical both to proper paper handling with a minimum of wrinkling, jams, skew, etc., and to consistent toner fusing – must be readjusted to compensate for this reduced diameter. In this situation, however, *even the best possible nip width adjustment will not result in the application of proper, consistent pressure to the paper over the full length of the rollers.* This adversely affects both paper handling and fusing performance, as the rollers no longer apply pressure to the paper from the center outward to stretch paper fibers for prevention of wrinkling, as they were designed to do. The reduction in upper fuser roller diameter can even alter its rotational speed significantly enough to cause further problems with paper wrinkling, jams, and/or skew, because the speed of the paper traveling through the nip remains constant.

In-specification mating between rollers (correct nip) enables consistent, effective paper handling.

Precise, consistent "mating" *between upper and lower rollers* ***ensures even, consistent pressure*** *along their entire length.*



Out-of-specification mating between rollers (incorrect nip) causes frequent paper wrinkling, jams, and/or skew.

Incomplete, inconsistent mating *between upper and lower rollers results in greater pressure in the center of the paper path than at the ends.*

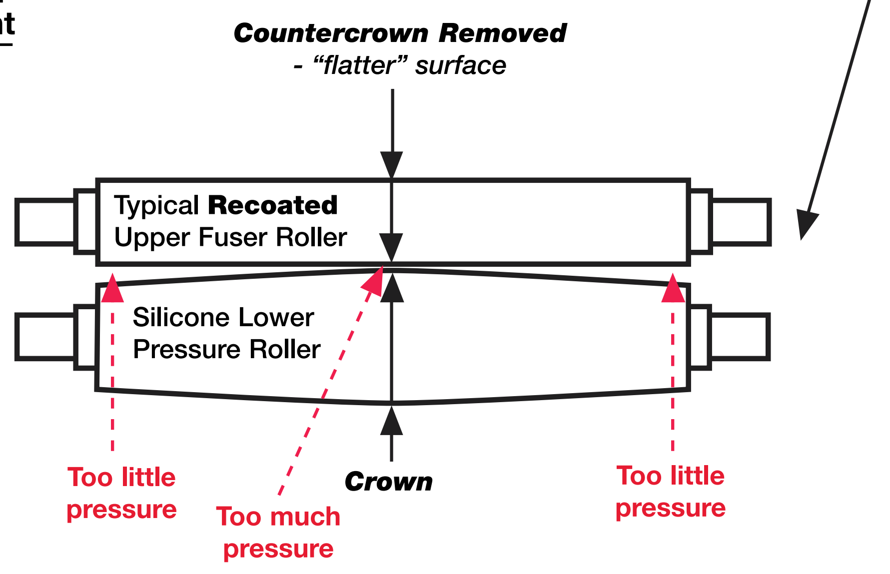


Figure 4. The **countercrown** (concave surface) of the new upper fuser roller shown at top is engineered to mate precisely and consistently with the **crown** (convex surface) of the silicone lower pressure roller, in order to provide consistent, effective paper handling, as well as toner fusing. When a stripping process, used by a recoating company to remove the original fluoropolymer coating, *partially or totally eliminates the countercrown* from the upper fuser roller, precise, consistent mating between the rollers is no longer possible. Instead, inconsistent pressure along the length of the rollers can cause frequent paper wrinkling, jams, and/or skew. *(Illustrations not drawn to scale; differences emphasized for representational purposes.)*

NOTE: A proper "mating" relationship between the upper and lower rollers is especially critical for handling of larger-size papers. Also, **the performance of longer upper fuser rollers [approximately 19.5 inches (49.5 cm) or longer], used in some newer-generation segment 4 and 5 PPCs to handle large-size papers "long side in," can be adversely affected to an especially great degree by the stripping process. In these machines, poor mating between the rollers is *especially* likely to cause wrinkling and other problems, due to the increased length of paper in the paper path.**

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In-specification mating between rollers (correct nip) enables consistent, complete toner fusing.

Out-of-specification mating between rollers (incorrect nip) causes inconsistent/poor toner fusing.

A recoated upper fuser roller with its countercrown removed has a ***reduced outer diameter*** *(average reduction: approximately 250 microns). The resultant change in the nip prevents proper, consistent transfer of heat, as well as application of pressure, to the toner and paper.* ***Results of inconsistent heat transfer and pressure can include inconsistent/poor toner fusing and copy quality problems.***

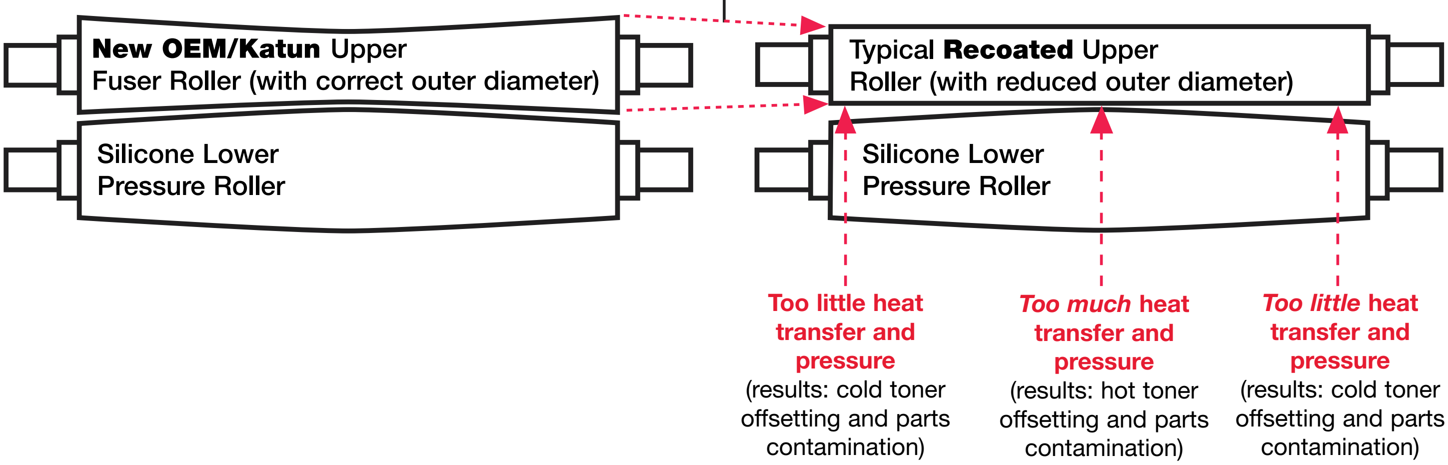

Figure 5. The combined effects of elimination of the upper fuser roller's countercrown and reduction of its outer diameter adversely affect the nip, which is *critical to toner fusing* as well as paper handling. With a recoated upper fuser roller that is severely out-of-specification, nip width cannot be adjusted to provide consistent, effective toner fusing. *(Illustrations not drawn to scale; differences emphasized for representational purposes.)*

Other common stripping methods can cause different performance problems with recoated fuser rollers. **A specific problem associated with stripping by sand- or grit-blasting is severe roughening of the aluminum insert surface; this can prevent control over coating thickness and produce a recoated roller with inconsistent, out-of-specification thermal (fusing) characteristics, which in turn can result in poor fusing and/or toner "filming" on the upper fuser roller.**

3. Recoated fuser rollers are cured using convection heating and/or batch ovens, and are therefore susceptible to uneven curing that adversely affects the performance characteristics of the fluoropolymer coating. In addition, curing a fuser roller a second time – let alone a third or fourth time – can substantially reduce the material strength of the aluminum insert and end journals. This makes the recoated fuser roller susceptible to breakage during machine operation (especially if worn fuser roller bushings and/or bearings in the machine add excessive resistance to its rotation). The results of such fuser roller breakage can include emergency service calls, costly machine and parts damage, and serious end-user dissatisfaction.

4. Those recoaters who apply a finishing process to their recoated rollers generally do not have the equipment necessary to produce smooth, defect-free surfaces with the nonstick properties necessary for optimum toner release. Rather, their "polishing" processes can leave small pits and scratches on the fuser roller surface, which can result in poor fusing performance and/or excessive toner offsetting.

5. Most recoaters apply only one (or, at most, two) types of fluoropolymer coatings to all the fuser rollers they sell, *regardless of specific machine and fuser station requirements, toner/developer types, and other critical considerations that vary between machine applications.* **Equally significant, most recoaters apply these coatings to all types of fuser rollers at generally the same thickness – *to the extent that they can control coating thickness* – regardless of all these factors.** This practice can have a severe adverse effect on product performance and/or life. **Coating thickness *must* be precisely specified and controlled to ensure optimum fuser roller performance, and most recoaters simply do not adhere to this critical requirement.**

6. Finally, most recoated fuser rollers have *never* been sample-tested in their intended machine applications. The products are only "tested" when they reach distributors/dealers and their end-user customers. Sometimes they perform effectively, *but frequently they don't!*

Summary

With recoated fuser rollers, you get what you pay for— *including the risk of serious product performance problems* that often comes with a very low price. Although some recoated fuser rollers provide satisfactory performance, a compromised or imperfect overall process leads to a lack of product quality, consistency, and dependability. This can be very costly in terms of emergency service calls, machine/parts damage, and serious end-user dissatisfaction.

Distributors/dealers who use recoated fuser rollers make significantly more service calls to address paper handling and fusing-related copy quality problems than those who don't – even if they don't realize it! Unfortunately, it can be difficult for distributors/dealers to identify the true causes of these costly service problems, and many do not realize that increased service calls for paper jams, skew, fusing-related copy quality problems, etc., are directly due to the use of recoated fuser rollers!

In contrast, each Katun fuser roller manufactured at Minco results from a precise, vertically integrated design-and-manufacturing process that guarantees excellent performance in the intended machines. Coating selection – from a *range* of exclusive, genuine DuPont TEFLON® brand coatings – is based on thorough assessment of specific machine requirements. Minco utilizes state-of-the art, Computer Numeric Control (CNC) equipment in directly controlling every step of the process— from engineering, to machining aluminum inserts, through coating at precisely specified thicknesses, curing, and finishing. Finally, thorough product inspections and quality assurance procedures ensure con-sistently excellent fuser roller performance. ***Distributors/dealers who purchase Katun fuser rollers receive quality, performance and life equal to <u>or better</u> than they receive with new OEM rollers... at <u>significant</u> cost sav-ings. Consequently, Katun fuser rollers are clearly the best available value!***

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