The effect of top roll defects on dyh5000 toyoda hara finisher draw frame on sliver unevenness at pt xyz

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Abstract. PT. XYZ is one of the spinning companies that produce cotton carded and Rayon yarn. One of the machines used in the yarn spinning process is the finisher draw frame. In the finisher draw frame process, slivers was produced. To maintain stability of the resulted sliver remain standard, it is necessary to check the sliver number (Ne1) and unevenness of the sliver (u%) with the uster unevenness tester tool. On the finisher draw frame, problems were often found, one of these was unevenness value (u%) that exceed the standard. The purpose of this study was to see the effect of top roll defects on unevenness (u%) and how to overcome these defects. After observing the sliver and testing it on the finisher draw frame, the slivers was tested using an uster unevenness tester 4. The results were not in accordance with company standards, which are 2.50% to 2.90%. The causes of the defect include: lapping material, use of equipment during lapping cleaning. To overcome the problem of defects, repairs were made by grinding the top roll or replacing it with a new top roll. After repairs or replaced with a non-defective top roll, the result is 2.82% and 2.88%

1. Introduction
PT XYZ is a national private textile company in the form of a limited liability company (PT) with venture capital originating from domestic investment (PMDN). PT. XYZ produces cotton carded and rayon yarn. The production process starts from the cotton raw material that is unraveled, mixed by the Blowing machine so that the fiber becomes more homogeneous. After the Blowing machine, cotton fiber is fed by the Chute feed to the Carding machine, the sliver from the carding machine is processed on the Drawing machine. The sliver of the drawing machine is then processed on the simplex machine, the result of the Simplex machine goes to the Ring Spinning machine, then is forwarded to the Winding machine, the result of the Winding machine is thread in the form of cones that enters the ultra violet chamber before entering the Packing section.

The observations were made on the cotton carded process on the finisher draw frame. The draw frame that was used in the company consists of two parts namely the breaker draw frame and the finisher draw frame. In principle, the draw frame does the process of stretching the sliver so that there is a reduction in material, alignment of the fiber, doubling and mixing of the material. On the Finisher draw frame PT. XYZ occurs a problem that results in defects in the sliver produced, namely unevenness (U%) generated outside the predetermined standard. After testing the unevenness (U%) using the uster tester 4, a problem was found in the stretching area. After checking on the machine it was found the top roll.

Kuang (2015) [1], discusses the comparison of theoretical calculations of yarn unevenness with previous research using different threads. The research shows that the theoretical unevenness of the yarn is the effect of fiber length and fiber quality. Yan (2008) [2], presents a semi-empirical method for predicting yarn unevenness. This study explains the variation in the amount of fiber can be used as an index of fiber straightening in assessing yarn unevenness in terms of changes in the amount of fiber in the transverse section.
Jabbar (2013) [3], examines the impact of increasing card production rates on yarn unevenness, using the Box-Behnken experimental design method. Increase in card cylinder speed significantly decreases the yarn imperfections, without significantly affecting any other yarn parameter. An increase in card production rate results in a significant increase in yarn imperfections as well as yarn unevenness. The number of draw frame doublings not only significantly affects the yarn tenacity and elongation, but also yarn hairiness. However, the effect of draw frame doubling is not linear. By increasing the number of doubling up to a certain level, the yarn tenacity, The result is that yarn unevenness increased by increasing card production rate and total yarn imperfections increase by decreasing card cylinder speed and increasing card production rate on Ring Spun yarn.

Yan (2010) [2] describes the basis of Martindale’s limit yarn unevenness, could not be used as a fully effective yardstick for evaluating the yarn unevenness caused by a specific spinning process. He constructs a new model with binomial probability distribution that describes the status of the fiber arrays in a yarn. The analysis of the model is done with the simulation of the parameters and the calculation of cotton ring-spun yarns is conducted. The new model can serve as a semi-empirical method for forecasting the yarn unevenness.

From some of the reasons above, the formulation of problems related to top roll is how the effect of top roll defects on the quality of unevenness (U%) and how to overcome top roll defects?

2. Methods
Data was obtained by observing the three factors that may be the cause of unevenness, such as: machines, humans, and the environment. Then the sliver is tested using Uster Tester 4. Uster Tester 4 can be used to measure u%, coefficient of variance (cv%) and average. These observations were made between July 3 and August 31, 2018

3. Results and discussions
The process on the finisher draw frame is an improvement process after the breaker draw frame, to produce better evenness. This process has the function so that the evenness of the machine gets better, the fibers in the sliver become more parallel with the sliver axis, the raw material derived from similar or unequal material is mixed and becomes more homogeneous, removes dust from the previous process. The finisher draw frame parts through which the material is as follows:

3.1. Feeder zone
The feeder zone consists of creel in which the sliver is fed. This section consists of sliver delivery to manage sliver movement, a feed roll to pull the sliver to be fed, sensors to detect broken slivers in the feed area and sliver conveying spoons to deliver sliver running to be more organized. In this area, efforts must be made as best as possible to prevent a draft, so that the surface velocity of all parts delivering slivers must be adjusted to the same. Before the sliver enters the drafting zone, the sliver is passed through the sliver guide which must be arranged so that slivers can be close together but do not overlap so that a sliver drawing is produced with good level. To ensure that the sliver is fed in a fixed number of duplicates, stop motion is installed in the creel area. If a break occurs, it will be easy to detect and a connection will be made by the operator.

3.2. Drafting zone
The drafting zone is the heart of the drawing process. In the drafting zone, a pair of scanning rollers was installed which serves to detect the number or size of the sliver fed to the stretching rollers. Stretching rollers consist of upper and lower rollers. Lower rollers are usually made of steel whose surface was smooth and grooved to avoid slippage of the fibers. The frontmost bottom rollers are fixed where they cannot be moved and the middle rollers and rear rollers can be shifted to get the desired setting distance. In the drafting or stretching area, the multiple slivers were stretched (draft) by pairs of stretch rollers which have different surface speeds. The speed of the stretch rollers which were in the
front sequence is always faster than the speed of the rear surface, the higher the speed ratio between the rollers, the greater the value of stretching and vice versa.

3.3. Delivery zone
The speed of delivery depends on the type of material being processed and the production plan. In this area the sliver was collected from the drafting zone. After exiting the calender roll, the sliver is inserted into the coiler through the trumpet and the coiler tube. Sliver from coiler is collected in a can that was on a rotating can table.

The cause of the unevenness (U%) was observed in the machine, human, and environmental factors. Machine factor was include the defects in the top roll. Human factors that was occurred because standard operational procedures are ignored. Then the observed environmental factors were temperature, humidity, and cleanliness of the machine area. During observation, temperature and humidity is in accordance the standard.

Then the following corrective actions are carried out: checking spare parts of machine and replacing defective top roll, ensuring that the room temperature is up to standard and maintaining the cleanliness of the machine area, and the operator is required to carry out standard operational procedures for machine maintenance. On the finisher draw frame, the causes of top roll defects include:

3.3.1. Lapping. Lapping is the situation of material which is rolled on the bottom or top roll. Lapping that is arises will affect the quality of the top roll.

3.3.2. Use of non-standard equipment when cleaning the lapping. The use of a cutter or knife is not recommended because it could cause top roll defects.

The results of sliver testing on the TOYODA - HARA finisher draw type DYH5000 in the year of manufacture 1990 at PT XYZ by using a uster tester 4 with a defective top roll spare part obtained a unevenness (u%) by 3.11% and 3.09%. These results are poor results and do not comply with company standards, which are valued at 2.50% - 2.90%. The test results can be seen in figure 1

![Figure 1. Uster tester report before correction](image-url)
Then improvement was made to the top roll, such as, by grinding, if not possible, then replace the defective top roll with the non-defective one. The results of sliver testing after correction were 2.82% and 2.88%. These results still comply to company standards. Test results can be seen in figure 2.

![Figure 2. Uster tester report after correction](image)

4. Conclusions
On the finisher draw frame, a decrease in the quality of the sliver unevenness ($u\%$) occurs was mainly due to the defective top roll. To overcome the defective top roll is done by replacing the top roll, so that the sliver unevenness falls away according to the company standard.

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