X Regrind Usage for TY27MX

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Abstract *— TY27MX is a high-runner catalog from ABB Caribe. Since the first quarter of 2020, high levels of scrap were detected at the production line caused by process variation and inherent conditions. Resin X regrind usage was selected as the best method to achieve scrap reduction of 15% and optimize material consumption. A regrind material validation was performed in order to assure catalog's functional performance and acceptable quality criteria. Internal quality procedure establishes that all parts must comply with RBT, Tensile Strength and Insertion Force specifications. A total of 48 parts per hour (3 hours total) were tested representing the molded full shot. RBT results were favorable, with all parts complying with the 2.50% maximum criteria. Likewise, all parts performed successfully during tensile testing complying with the 120 pounds minimum requirement. Also, insertion testing was positive with all parts complying with 6.00 pounds maximum force. Since TY27MX's properties were not compromised with the material mixture, regrind usage can be used permanently as part of the process.*

Key Terms *— Insertion, RBT, Regrind, Resin X, Tensile, TY27MX*

INTRODUCTION

Since the first quarter of 2020, ABB Caribe, an electrical device company specialized in cable ties manufacturing, identified high levels of scrap in the production line corresponding to the TY27MX catalog, shown in Figure 1. The molding process for this product requires about 117,000 pounds of resin X per quarter. However, process variation and inherent conditions are affecting material consumption, which increases scrap production up-to 15% approximately. By implementing the use of X regrind, a scrap reduction will be achieved with estimated cost saving of $190,000 yearly.

By the completion of this project, the following objectives were expected to be achieved:

- Reduce scrap production for TY27MX catalog by 15%.
- Save up-to $190,000 a year in material consumption.
- Maintain customer satisfaction by producing a high-quality product regardless of the resin mixture used.

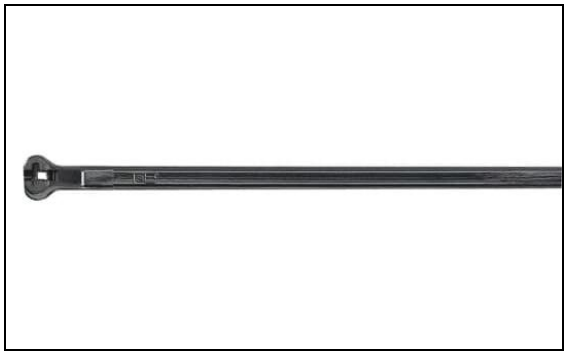

Figure 1
TY27MX

LITERATURE REVIEW

Regrind is thermoplastic material that has been granulated and reintroduced into the process, usually by mixing it with virgin plastic [1]. The ultimate goal of using regrind is to achieve scrap reduction while optimizing material usage. Usually, during the injection molding process, material recovered from the runner and the sprue of the full shot are typically used as regrind, since it tends to be sufficient to sustain the operation at consistent levels. It may be possible to use 100% of regrind in a specific product, because regrind that has not been abused will retain as much as much as 90% of the properties of virgin [2]. However, it is well known in the plastics industry that the recommended level of regrind is 15%.

One of the most important things to take into consideration when implementing a regrind process is material handling. In order to successfully mix regrind with virgin material it is necessary that the material is properly dried. Regrind property inconsistency often causes problems in final part performance [3]. If the moisture content of the mixture is not adequate, the possibility of having multiple quality issues such as tensile failure is very high. Also, size reduction is necessary because the material particles must be a suitable size for further processing [4].

If implemented correctly, the use of regrind can be really favorable to the organization. Some of the benefits of plastic recycling are that it brings important savings of primary materials, use of recycled product for new applications, new possibilities for products made from recycled material, minimization of communal waste, creation on new employments, and conservation of matter [5].

ANALYSIS APPROACH

Catalog TY27MX is one of the high-runners of ABB Caribe. Process variation and inherent conditions caused mainly by mold and machine aging increased scrap rate to 15%. Savings on material consumption for about $190,000 a year are expected to be achieved.

Scrap reduction of 15% was achieved by optimizing X resin usage for TY27MX by mixing regrind with virgin material. In order to assure compliance with required quality criteria, a regrind material validation was performed. Mold 263 with 48 cavities was used for trial runs. Recovered material from production waste was properly grinded and dried in order to maintain resin's properties and parts performance. Functional testing including Tensile Test, Insertion Force Test, and Rotary Bend Test (RBT) were performed to produced parts. Regrind percentage utilized was monitored by retrieving reports from resin X blender's software.

RESULTS AND DISCUSSION

TY27MX produced parts during validation phase were properly tested according to quality procedure. Table 1 shows the results of the full molded shot (48 parts) during a three-hour period. RBT tests were performed to detect material brittleness, tensile tests to measure catalog's tensile strength and insertion tests to measure catalog's insertion force. Collected data shows that all parts performed successfully and passed functional testing according to specifications.

Table 1
Summary of Functional Testing Results for TY27MX Validation Run in Dry as Mold (DAM) Condition

Material: **Resin X**
Molding Machine: # 17
Mold: 263
Barbing Machine: # 2
Barbing Machine Die: # 21.2

1st Hour			
	RBT	**Tensile**	**Insertion**
Spec.	2.5% Max.	120 lbs. Min.	6.00 lbs. Max.
Min =	0.0%	182.3	2.53
Max =	2.0%	196.0	4.01
Avg =	N/A	190.1	3.35
48 parts tested			
2nd Hour			
	RBT	**Tensile**	**Insertion**
Spec.	2.5% Max.	120 lbs. Min.	6.00 lbs. Max.
Min =	0.0%	189.1	2.25
Max =	0.0%	211.1	4.20
Avg =	N/A	196.4	3.14
48 parts tested			
3rd Hour			
	RBT	**Tensile**	**Insertion**
Spec.	2.5% Max.	120 lbs. Min.	6.00 lbs. Max.
Min =	0.0%	190.2	2.84
Max =	0.0%	214.3	4.40
Avg =	N/A	200.5	3.50
48 parts tested			

CONCLUSION

Regrind usage is a proven and reliable method used to reduce scrap, while optimizing material consumption. Resin X regrind implementation for TY27MX had positive results during the validation process, complying with all functional and cosmetic criteria. Since the catalog's properties were not compromised with the material mixture, regrind usage can be implemented permanently as part of the process. The objectives of this project were met, since scrap reduction for the TY27MX production line was achieved by using 15% of recovered material as regrind.

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