



RESEARCH ARTICLE

The promotion and application of green remanufacturing: a case study in a machine tool plant

Boxue Song¹ · Xingyu Jiang¹ · Song Wang² · Qing Liu² · Tianbiao Yu³

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Abstract

Low parts utilization, high resource consumption, and low profit margins have become the main factors hindering the development of machine tool remanufacturing in China. A machine tool manufacturing company was taken as a case to investigate the improvement of the remanufacturing production line. The remanufacturing workshop and production line of the case enterprise have been completely re-planned, adding remaining life assessment, additive manufacturing, quality monitoring, and reassembly quality control. After applying the new production line, the energy consumption and water consumption of each remanufacturing machine tool were reduced by 29.87 kgce and 0.042 m³, respectively, and the pollutants generated were reduced by 4.352 kg. With the increase in remanufactured machine tool capacity, the part reutilization has increased by 26.9%. Despite satisfactory results, machine remanufacturing still faces many difficulties in China. Combined with case enterprises, the current situation of machine tool remanufacturing in China was discussed, and several suggestions for promoting remanufacturing in Chinese manufacturing companies were put forward.

Keywords Machine tool · Remanufacturing · Improvement · Policy

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Highlights

1. New remanufacturing production lines and remanufacturing systems.
2. Achieved energy-saving and material-saving, higher remanufacturing and reutilization rates.
3. Higher remanufactured machine tool sales and profits, and more jobs.
4. Urgent need for more financial and policy support.

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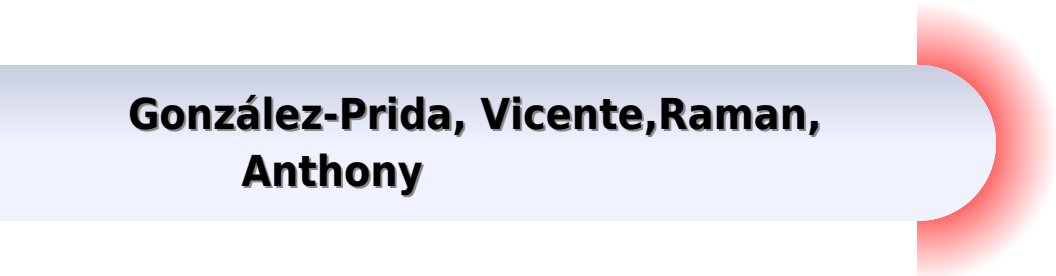
Introduction

Remanufacturing is one of the key players of resource efficiency and has increasingly been applied by countries (Tian et al. 2022a, b, c; Boeda 2017; Low and Ng 2018; Abu et al. 2014). Still, many manufacturers, sellers, and even government have difficulties in promoting remanufacturing. Although recycling at the end of the life cycle has been considered by many products during the initial design phase, this type of “recycling” simply keeps used products in service and their quality of work cannot be guaranteed. Unlike recycling, recycled waste products can be remanufactured for reprocessing, and advanced manufacturing technologies can be used to extend the life cycle with quality assurance. In this trend, the concepts of active remanufacturing (Song et al. 2015) and adaptive remanufacturing (Krystofik et al. 2018) are gradually being applied.

Remanufacturing companies need more accurate capacity planning and pricing strategies. Unreasonable remanufacturing costs and pricing will cause manufacturers to abandon remanufacturing (Xiong et al. 2016). Andrew-Manot and Ibrahim (2013) discussed a remanufacturing inventory adjustment model with variable remanufacturing batch sizes. Li et al. (2015) believed that the random remanufacturing revenue and demand have brought great

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orphaned Will must start a new life and overcome his prejudices.
