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# Latest clean manufacturing trends applied to a world class manufacturing management for improving logistics and environmental performance

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## Abstract

Throughout this paper it will present the benefits of the latest trends in sustainable manufacturing, relating them to the managerial practices and the standards proposed by the World Class Manufacturing methodology. A special emphasis will be given to Environment and Logistics pillars, focusing on how to improve the environmental performance of logistics processes. The ultimate purpose would be to suggest a catalog of measures to implement on manufacturing industry that could be easily adopted in the area of Supply Chain generating added value for the companies and their environmental and social surroundings.

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## 1. Introduction

In the present global market, society and government have increased their attention to companies' environmental and social impacts. This demand has resulted in Cleaner Production broadening, defined by the United Nations Environment Programme in 1990 as the continuous application of an integrated environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment [1].

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Simultaneously, the rising global competitiveness has forced a high number of manufacturing organizations to implement World Class Manufacturing (WCM) approaches in order to improve their performance [2], not just in terms of profitability, but also in terms of sustainability in order to respond to social demands. Since Richard J. Schonberger adapted the Japanese continuous improvement (Kaizen) standpoint to the occidental framework [3], companies from different industries such as Unilever, Tetra Pak, ArcelorMittal, among others, have adopted the WCM improving their global performances. The automotive sector is one of the most noteworthy, represented by companies as the Fiat Chrysler Automobiles (FCA Group) that systematically applies WCM enabling the improvement of all the activities related to its products manufacture.

In this framework, this paper will focus on strengthening the Environment WCM pillar by means of the newest trends on Logistics that allow companies to boost their economic and environmental results. The aim will be to provide instruments to establish a Green Logistics Management (GLM) that will present an opportunity to competently respond to the escalating expectation of the international community for resources conservation and to achieve environmental performance profitably [4].

## 2. Methodology

In this paper, it will bring up the benefits of the latest trends in Green Logistics (GL) relating them to the managerial practices and the standards proposed by the WCM. A special emphasis will be given to Environment and Logistics pillars, focusing on how to improve the environmental performance of logistics processes.



Fig. 1. The 10 Technical Pillars in WCM, focus on Logistics and Environment Pillars.

Firstly, it would introduce the WCM concept, described as a structured and integrated production system that encompasses all the processes of the plant, from safety to the environment, from maintenance to logistics and quality. The goal is to continuously improve production performance seeking a progressive elimination of waste, in order to ensure product quality and maximum flexibility responding to customer requests [5].

Bearing in mind this goal, the new clean manufacturing trends perfectly match with the scope of WCM methodology. The clean manufacturing principles are highly oriented towards the WCM target of zero waste that could be correspondingly understanding under the 3Rs principle: Reduce, Reuse and Recycle. In a manufacturing environment, for example reducing the use of raw materials, reusing the scraps from the manufacturing processes (likewise the energy) or recycling the wastes generate would mean a path towards the zero waste encouraged by the WCM principles.

The WCM methodology works in two different fronts, one technical and other managerial, each one of these lines of action are implemented through 10 different pillars focusing in its case on the 10 technical pillars that include the Logistics and the Environment ones. The process to achieve a continuous improvement is based on a 7 Steps approach for each of these pillars and the steps are divided in three phases: reactive, preventive and proactive. The more the company progress in its performances, the more it rises in these 7 Steps, looking forward striving to reach the World Class Level.

In accordance with the scope of this paper, the following pages will demonstrate how recent Green Logistics trends in the industry help to achieve this target by pursuing the improvement of the environmental performance. In this sense, regarding the Environment pillar, GL could be a key factor in assuming a proactive attitude to grow towards the World Class Level, contributing to accomplish the targets proposed for the Steps 6 and 7.

In that way, Step 6 in Environment pillar pursues a complete synchronization between the sales and manufacturing areas, defining the role of Logistics. The efforts concerning this step should be directed to improve a full supply chain (from the suppliers to the consumer) and to identify and remove waste and losses throughout the system. Companies

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