

**IMPLEMENTACIJA VITKE PROIZVODNJE U POSTROJENJU ZA  
MESANJE ULJA U RAFINERIJI AL-ZAVIJA****IMPLEMENTATION OF LEAN PRODUCTION IN OIL MIXING PLANT AT  
AL-ZAWIYA REFINERY**

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**Oblast – PROIZVODNE STRATEGIJE**

**Kratak sadržaj** *Lean proizvodnja je uvedena u prerađivačku industriju pre skoro trideset godina. Suština novog poslovnog modela bila je da se otpad eliminiše pomoću lean alata prema osam kategorija otpada Taichi Ohnoa. Mnoge fabrike su postale konkurentnije sa tehnikama za smanjenje otpada, ali neke od njih su se suočile, i još uvek se suočavaju sa neuspesima. Ovim istraživanjem predloženo je da se neki od lean alata primeni unutar jednog od industrijskih objekata u Libiji, zastupljenog u fabrici za mešanje i punjenje mineralnih ulja koja se nalazi u rafineriji Al-Zaviia. Kako bi se postigli ciljevi istraživanja, biće primenjeni odgovarajući alati LEAN a to su: 5s, JIT, kanban, vizuelno upravljanje, totalno produktivno održavanje, rešavanje problema.*

**Ključne reči:** *Lean proizvodnja, 5S, JIT, kanban, vizuelni menadžment*

**Abstract** – *Lean manufacturing was introduced to the manufacturing industry almost thirty years ago. The essence of the new business model was to eliminate waste using lean tools according to Taichi Ohno's eight categories of waste. Many factories have become more competitive with waste reduction techniques, but some of them have faced, and still face, setbacks. With this research, it is proposed to apply some of the lean tools inside one of the industrial facilities in Libya, represented by the mineral oil blending and filling plant located in the Al-Zawiya refinery. In order to achieve the objectives of the research, appropriate LEAN tools will be applied, namely: 5S, JIT, kanban, visual management, total productive maintenance, and problem-solving.*

**Keywords:** *Lean production, 5S, JIT, kanban, visual management*

**1. Introduction of the company**

Al-Zawiya Refinery is the first refinery established by the National Oil Corporation, and is located on the Mediterranean coast about 50km west of Tripoli. It was opened in 1974, and the first national company in the field of oil manufacturing and refining was established as of 16. 09. 1974.

**NAPOMENA:**

**Ovaj rad proistekao je iz master rada čiji mentor je bio prof. dr Milovan Lazarević**

The Al- Zawia Company carries out the following activities: Crude oil refining, asphalt manufacturing, mineral oil mixing, and plant. Al-Zawiya Oil Refinery Company, despite its many experiences in the application of modern technology and production management systems. Its interest is almost non-existent in the lean production system despite its importance. On this basis, this system was chosen to find a solution to some of the problems that will be illustrated by pictures, which occur during production processes within the mineral oil mixing and filling plant at the Zawiya Oil Refinery.

**2. Lean production**

Lean production system is an important approach in the production environment. This aroused the interest of researchers in the field of production management in general. As they consider reducing waste in the production process necessary, to increase productivity and open the horizon for competition and continuity. Lean production is defined as an integrated system that includes various organizational practices. Their aim is to increase productivity, improve quality, and reduce waste and cost to achieve continuous improvement in quality, time, and flexibility and to reduce the cost of the company's activities [1]. Another common definition is that lean is the persistent pursuit of the elimination of waste. The Japanese word for waste is Muda, which describes any activity that's done that adds no real value to the product or service [2].

**3. Wastage in lean production**

Lean manufacturing is an entry point for all processes that seek to meet demand immediately, with the required quality and without wastage.

It is the approach that differs from the applications of traditional processes. Aims to focus on eliminating waste and speedy handling. This contributes to reducing the stockpile of materials [3].

Wastes can be classified according to as follows :

1. The increase in production.
2. Transportation and material handling.
3. Storage.
4. Unnecessary movement.
5. Waiting times.
6. Overproduction.
7. Defects.

#### 4. Lean production tools

Lean production tools and techniques demand a mental shift among employees, steady elimination of process wastes, and perfection of best operational practices. Lean production tools and techniques solve a myriad of factory efficiency problems. Lean production tools are a philosophy that seeks to establish reliable manufacturing activities to minimize process and production wastes. The successful implementation of Lean tools means that companies can do their business goals using few resources. Lean tools are the foundation of Lean Thinking, and the most popular tools applied are listed below.

##### 4.1. 5S

The 5s is a very crucial lean method and it is like a cornerstone to apply for other lean tools as well. It is such a philosophy to increase efficiency by eliminating waste and improving speedy workflow. The name 5s comes from the first letter of the five Japanese words starting with S: "Seiri, Seiton, Seison, Seiketsu, and Shitsuke".

5S is the method for organizing case places and keeping them organized. This discipline requires eliminating things that are not needed to create a better flow to get the goods needed. Creating a better work environment is another vital benefit of 5s like many others [4]. By applying 5S tool in the mineral oil mixing and filling plant, one of the problems inside the plant will be solved, as shown in the following (Fig 1 and Fig 2).



Fig 1. Before applying 5S tool



Fig 2. After applying 5S tool [5]

##### 4.2. Kanban card

The card system was a name given to the production system (JIT) in the seventies launched by early researchers. But this misnomer was later replaced, as the

card system is a simple part of the JIT system, and kanban is a Japanese word that refers to a sign and means the visible record to indicate the need for materials and parts. The kanban cards are rectangular paper, laid out in transparent covers, and the card system can be replaced by any other means that serve the same purpose such as standard containers or signs of different colors and numbers. The Kanban system is a way to control the movement of materials in different quantities between workstations.

As there are no parts that can be produced or moved without the use of cards, therefore, card control was invented, to ensure that materials arrive when they are needed, and until the finished product comes out [6]. The chemical storage problem for the mineral oil plant, will be solved by applying kanban as shown in (Fig 3 and Fig 4).



Fig 3. Before applying for a kanban card



Fig 4. After applying kanban card [7]

##### 4.3. Just-in-time production system (JIT)

The Japanese were interested in increasing production efficiency by using the Just-in-Time (JIT) system. Their view of the meaning of the word (wasted), whether in freezing capital in stores or wasting during the stages of production until their concept reached the meaning of economy in the space of place. This resulted in their view of the necessity of reducing the stockpile; all this led to the existence of the Little Theory in terms of dealing from the beginning with small quantities.

Just-in-time production is defined as "a production system in which the operations and movement of materials and products. Done when they are required, the result is very little stock and large production" [8]. Applying this system in the mineral oil plant, bulk storage of raw materials is eliminated.

Thus it becomes necessary to store the raw materials for use and also in an organized manner as shown in (Fig 5 and Fig 6).



Fig 5. Before applying JIT production system



Fig 6. After applying JIT production system [9]

#### 4.4. Visual management

Visual management (VM) is widely used in advanced manufacturing plants and has been pointed out as one of the fundamental blocks of the lean production philosophy. VM forms a base upon which other improvement approaches are built and, for this reason, can be adopted as one of the key steps at the beginning of improvement programs. A wide range of tools and approaches have been used in visual management, including visual signs, fool-proof devices, the removal of visual barriers, and programs for maintaining a clean and orderly workplace [10]. By applying visual management in the mineral oil factory.

The workplace will be clarified in terms of equipment locations, explanatory paths, and information on how to operate the machines and how they work. The following (Fig 7 and Fig 8) show before and after applying visual management in the factory.



Fig 7. Before applying visual management

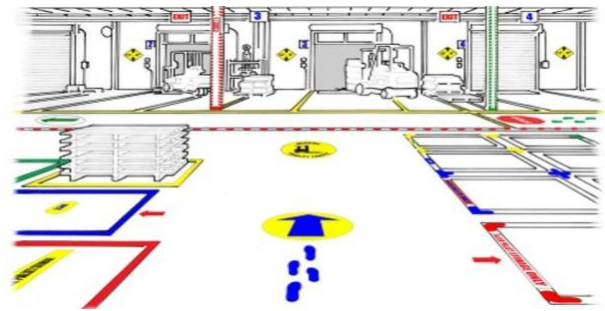


Fig 8. After applying visual management [7]

#### 4.5. Total productive maintenance

Total productive maintenance (TPM) is known, as the process of using machines, equipment, employees, and supporting processes to maintain and improve the integrity of production and the quality of systems. Put simply, it's the process of getting employees involved in maintaining their own equipment while emphasizing proactive and preventive maintenance techniques. Incorporating lean manufacturing techniques, TPM is built on eight pillars based on the 5S system as shown in (Fig 9).

Applying total productive maintenance will reduce the accident rate for workers inside the mineral oil factory.



Fig 9. The eight pillars of TPM [11]

#### 4.6. First in First out

The FIFO method (first in first out) is interpreted as a method of valuing First in First Out inventory assuming that the first purchased item is the first item used or sold, regardless of the actual physical flow. Also, the definition and operation of the FIFO method in industrial storage have to do with the way that goods are moved and are a simple concept: first in, first out. In other words, the first good or unit load to enter the warehouse is the first one out as shown in (Fig10). The ultimate goal of FIFO is to achieve an excellent stock turnover in the warehouse, giving priority to the output of products that have been stored the longest and can spoil or become obsolete [12].

Applying this method in the mineral oil factory, will prevent damage to raw materials represented by chemical additives.

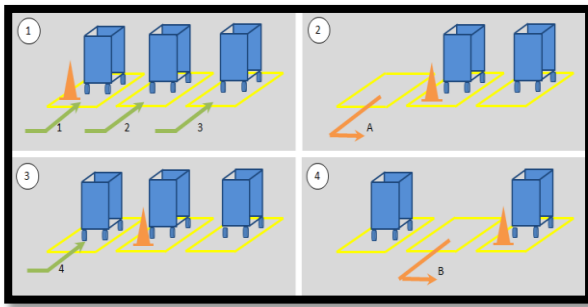


Fig 10. Withdrawal and storage by first in first out

## 5. Conclusion

This paper documented the most frequent and significant basic lean tools for waste elimination when implemented in the mineral oil mixing plant in the Zawiya oil refinery. The documented lean implementation framework enabled us to examine the occurrence of lean tools in all lean implementation stages, where the key lean tools were pinpointed. The results can help the Zawiya oil refinery to see the lean experts' way of thinking. In brief, the management must have a deep understanding of organization waste and sound knowledge of the lean toolbox to make lean implementation more successful. Although Lean can seem like a magical thing, there are several steps needed to properly understand and apply the Lean philosophy. Accordingly, education is very important to know the philosophy of lean production. Lack of knowledge is present in the factory, so education in a wide scope is necessary if we want success in a wider.

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## Short biography:



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