CONTINUOUS GROWTH OF PRODUCTIVITY- BASED PERFORMANCE OF THE ORGANISATION

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Rezumat.
Lucrarea prezintă modalități de creștere a performanțelor și competitivității companiilor industriale care doresc să introducă o viziune mai cuprinzătoare a performanței (rezultate ambițioase, accelerarea performanței, un proces de producție robust). Conceptul de Performanță se bazează pe un Sistem Industrial pentru a stabili legătura dintre robustețea sistemului și performanța acestuia. Un sistem industrial transformă materia primă în produse finite solicitate de client, folosind mijloace și resurse umane. Performanța sistemului va fi evaluată prin rezultatele QCD (Calitate, Costuri, Termene) ale produsului rezultat, calitțile fiind strâns legate de performanța economică.
În gândirea japoneză, „LEAN nu este niciun proiect, niciun set de instrumente, ci un mod de gândire"; Lean, adică "suplu, fără exces", caracterizează căutarea permanentă a perfecțiunii prin eliminarea rebuturilor și a lucrurilor inutile.

Abstract.
This paper presents various ways for the growth of the performance and of the competitiveness of the enterprises willing to introduce a more comprehensive view on the performance (ambitious results, acceleration of performance and a robust production process). The performance concept is based on an Industrial System in order to set the connection between the robustness of the system and the performance. An industrial system means transforming of the raw material in end products requested by the clients, using tools and human resources. The performance of the system shall be assessed by means of the QCD results (Quality, Costs, Terms) of the final product, the qualities being strongly related to the economic performance. In the Japanese thought, LEAN is neither a project nor a set of tools but a way of thinking; Lean, that is" supple, with no excess "characterising the permanent search for perfection by eliminating scrap and unnecessary things.

Keywords: LEAN, industrial system, performance, robustness, robust process.

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1. Introduction

The development of industry from the beginning of the 20th century was the starting point for the development of several management model based on operations, methods, standardization, the analysis of production times. Starting with the period before the second World War, due to the consumption growth, the quality of the products and of the services experienced a continuous quality growth, thus improving the operation management techniques. At the end of the 20th century, the competitive boom and the diversity of consumption demand, due to globalisation led to manufacturing processes managed according to high standards on all levels – costs, quality, speed, flexibility, reliability, delivery.

In order to be implemented and to function, an industrial manufacturing process involves carrying out the steps of receiving firm orders from the beneficiary and developing a plan of objectives and activities at the enterprise level; their fulfillment allowing the development of the stages of an industrial production system.

A production process consists of all the conscious actions of employees of an enterprise, carried out with the help of different machines, equipment or installations on raw materials and materials in order to transform them into products of a certain market value, including not only the execution of the products but also the preparation production, technology-material endowment, machine maintenance, transportation inside production areas.

The systematic study of how activities are carried out in the production process aims to identify those non-rational activities that produce non-added value (NVA). In order to identify all the causes of NVA, it is necessary to know the structure of working time for each workstation and to perform complex analyzes on the production process.

The LEAN concept and the methodologies used by this system were used by many companies, there were also identified problems related to their successful implementation.
For the companies with a high-performance standard, the implementation of the LEAN sites did not bring significant performance results; for the companies with low performances/ low production the concept was implemented successfully growing the quality of production and the performance of the employees.

LEAN comes from Toyota, the Japanese producer which evolved in global competition a long time ago. In 1988, the Toyota Production System (TPS) was introduced being developed in order to survive with a minimum of resources in

the context of the economic crisis. Due to the high number of materials, financial and human constraints, TPS was forced to choose between the policy of reducing the waste in the company as a strategic action to meet the goal. Under the hard-economic conditions, Toyota supported and flourished due to the high efficiency and the productivity of its production system.

The implementation of the LEAN working sites can be made only in a developed company being interested in the new trend of performance and productivity growth – a developed culture related to the environment (waste management, its storage) by applying the methodologies of protecting the environment and the management systems. There is a high need for the improvement of the manufacturing performance in order to reduce the industrial pollution, the low consumption of materials and energy, less losses, less psychological reaction for the human resources. The research in the field of environment, safety and health (ESH) has a strong tradition to carry out researches in the manufacturing industry, to improve the ESH conditions on the working place and was connected to the management strategy and the significant technical practices: the prevention of diseases and injuries, the environmental sustainability, the reduction of the psychological risks, the corporate social responsibility, the compliance with the regulation.

Among the advantages of the implementation we can mention several dimensions:

- economic performance;
- social performance;
- environment;
- sustainability.

There is a need for deeper studies related to the business policy and the knowledge of all stages regarding the successful implementation.
A LEAN working site cannot be implemented without the support of the higher management and without a team with high abilities/competences. The LEAN concept can be hardly implemented or not implemented at all in the small and medium companies due to the limited resources.

The Lean Manufacturing, as it was described by James P. Womack and Daniel T. Jones in order to guide the managers in their process of introducing the Lean principles in manufacturing, in "*Lean Thinking: Banish Waste and Create Wealth in Your Corporation*", book published in USA in 2003, means a thinking and an action process in 5 steps, that are:

1. Mentioning **the value** for each family of products from the point of view of the end client;

2. Identifying all the activities in the **value flow** for each family of products eliminating as much as possibly those activities generating losses;

3. Arranging the value creating activities in a succession (flow) of steps so that the product should reach the end client with a **more continuous flows**, with more interruptions, stops and intermediary expectations;

4. When the value flow was set and introduced, any internal or external client can apply the ”pull” system in order to pull the product upstream, on the production flow;

5. After the value was specified the identified value creating activities, the eliminated loss generating values, the set and introduced value flow, we can move on the operationalisation of the process and its improvement until we reach an optimum level where the added value is maximum and most of the losses are eliminated.

2. Current stage

The tradition production industry is gradually replaced by modern processes of intelligent production. In this process, the informatisation and the industrialisation are primary elements in the period of transformation of the enterprises and using the technology and the scientific management represents the core for a successful transformation.

The solution in order to increase the competitiveness of modern enterprises is to fully use the advantages brought by the information technology, the industrial technology, the science and the modern management.

The evaluation of the manufacturing processes through the VMS method (Value Stream Mapping- the conceptual method for the integration of the sustainability indicators) was carried out by means of the assessment models of the sustainability indicators (2009-2014), the results demonstrating that the method identified various levels of sustainability of the manufacturing processes, these being possible in the development on improvement scenarios.

Lean Production aims at the elimination of the activities and of the valueless procedures added to the final product; in consequence it increases the operational improvement in a company due to the implementation of the Lean Production

practices. The use of the VSM tool led to the reduction of the level of inventory and of the repairing (see fig. 1).

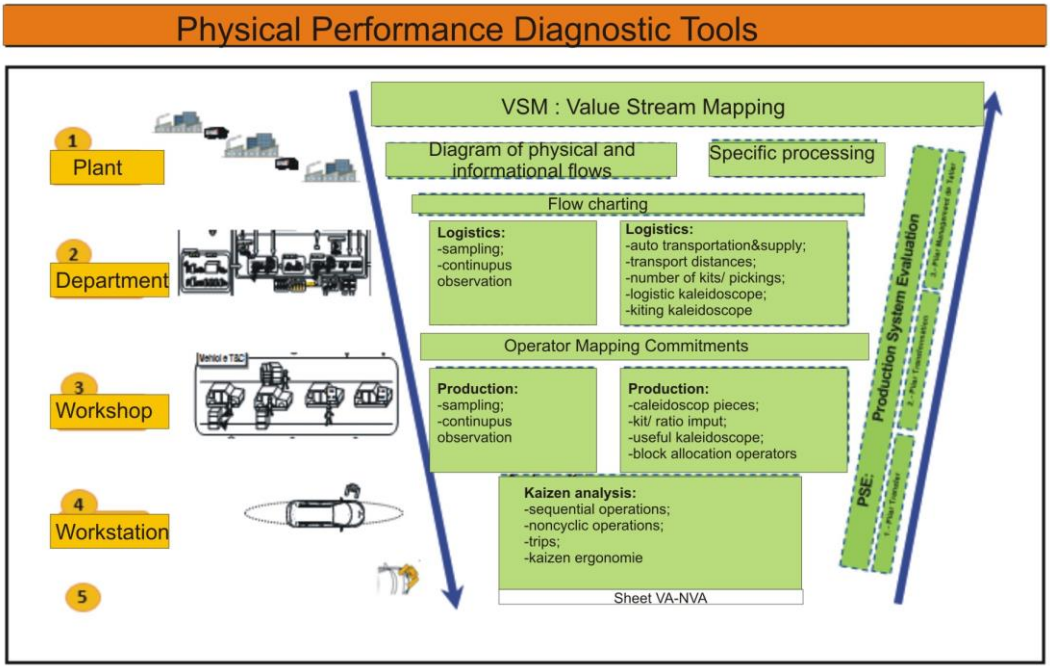

Fig. 1 VSM Diagnose

As opposed to the production flow benefits, Dues et al. (2013) made the following comments ”the usage of the LEAN Manufacturing tools maximise the earnings related to the environment and social fields of the manufacturing process”. For this reason, a lot of authors are looking to integrate the sustainability of the indicators in VSM (see Fig.2/ 3).

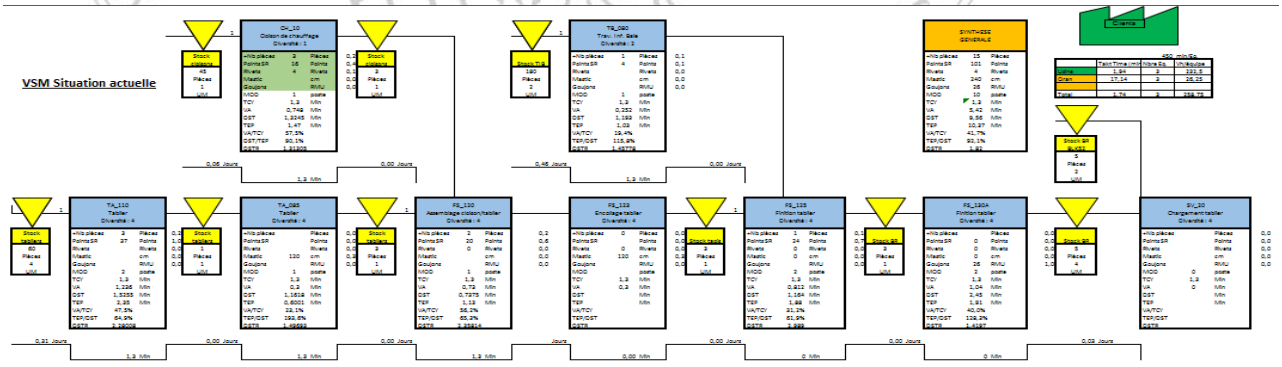

Fig.2 VSM analysis – initial situation

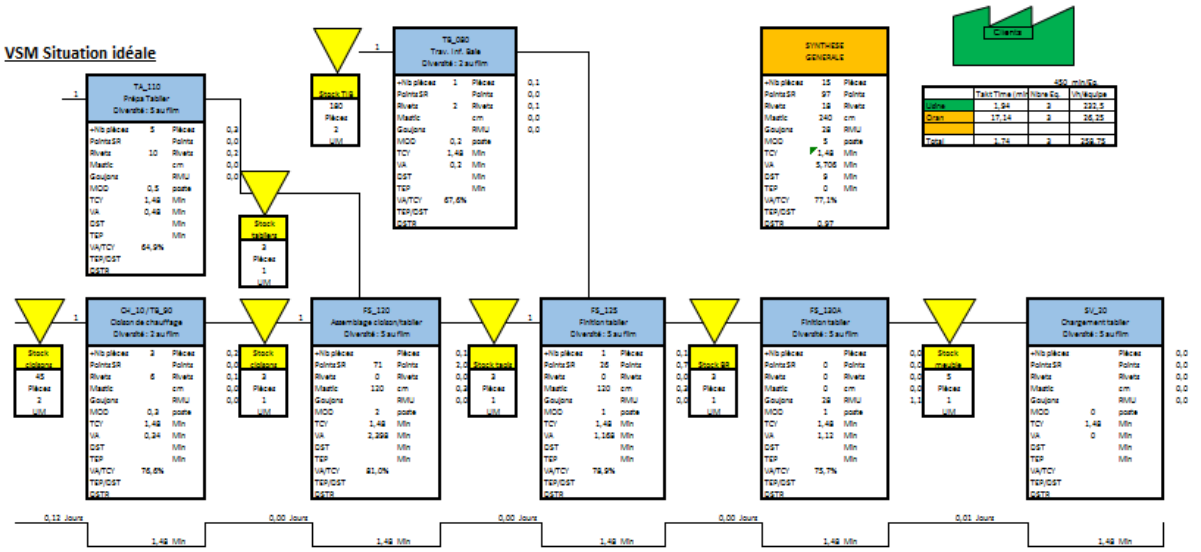

Fig.3 VSM analysis – the ideal situation

Paju et al. (2010) integrated in the production cycle the Life Cycle Assessment (LCA) and the Discrete Events Simulation (DES) in VSM. Faulkner and Badurdeen (2014) used a group of integrated indicators in VSM in order to assess the level of sustainability in companies with various characteristics according to the production volumes and the types of products. The patterns used the consumption of indicators (water, energy and raw materials), the level of the noise and the ergonomic analysis of the working place as sustainability indicators.

Lee et al (2012) and Kumaraguru et al (2014) who analysed the changes of the production systems and services towards sustainable solutions, underlined the need to develop methods of measuring the sustainability levels for the manufacturing processes [Lee et al.2012 and Kumaraguru et al.2014]. We can notice that despite the evolution of the production systems towards durability, there are no assessment standards and methods of sustainability in the processes of the manufacturing industry and with no consensus on the indicators which should be used.

Ghadimi et al (2012) declared that sustainable production should become an important problem among the production organisations and there are more methods to assess politics regarding social responsibility and sustainable development on the level of the organisation. There is also the possibility to develop assessment methods for sustainability in the manufacturing processes taking into consideration the three dimensions of sustainability – economic, social and environmental.

LEAN reflects a wider management philosophy which incorporated both the technical functionality, the tools and the human resources practices. The tools relying on the base of the concept are used to reduce the quantity of waste, the commercialisation time and the production space.

From the point of view of human resources, LEAN is designed to promote a more difficult work, a higher responsibility for the first rang employees by using inter-functional and self-directed working teams.

The purposes of the lean production can be differently synthesized:

- Quality improvement: the enterprise needs to understand the wishes of the clients and to elaborate processes satisfying these requirements;
- Eliminating losses: ”losses” are considered aby activities consuming time, resources or production space, without adding any value to the product or service;
- Time reduction: this objective involves the reduction of the time used in order to finish any activity from the beginning up to the end;
- Reduction of the total costs: in order to reduce the costs, the enterprise shall produce only upon the requests of the clients.

3. LEAN production tool

Cellular production: organises the whole process for a certain product or for similar products in a group including all machines, equipment and the necessary operators.

Just-in-time (JIT): is a system where a client initiates the request and the request is then sent from the first manufacturing stage (gross material), up to the final assembly, therefore ”targeting” all the requests when they are necessary.

JIT is an applied management philosophy to manufacture according to customer request, only:

- what is required (required by customer);
- when it's necessary;
- as necessary;
- delivered where necessary.

JIT is a set of tasks designed to help achieve a maximum output with minimal stocks by reducing inter-post operations and eliminating losses, all through standardized and controlled processes.

Visual Management: Represents "the ability to understand the state of a production area in 5 minutes or less, through a simple observation, without using the computer and without talking to anyone." By visual management, you are signaling the achievement of the conditions that can determine producing an abnormal situation, so that a corrective action can be applied on time.

Examples of abnormal situations:

- an operator who does not apply the instructions;
- Continuous adjustment of a car;
- a lost specification sheet;
- products not timely delivered to the downstream post;
- a container in an unidentified space;
- lack of cleanliness;
- large stocks in working hours;
- high inactivity times, etc.

As an effective method of applying visual management, "Andon", the one who "draws attention" remotely (eg an electronic device, a beacon / sound beacon that alerts about the working / non-working of equipment, equipment in set parameters, production records produced against planned production, workstation indicators, delivery and storage points of products, maintenance plans, performance indicators and quality indicators etc).

A common Andon has three colored areas (green, yellow and red) - the code representing the parameters of the monitored equipment (green - functioning in the parameters, yellow - requires more careful monitoring, indicating possible damage to the equipment, red - a critical situation requiring immediate adjustments / remedies.

Kanbans: a signalling system for the implementation of the JIT production; it is one of the strategies used for the small productions, with a minimum inventory and low costs. In such a manufacturing system, we can control the levels of the buffer stocks in regulating production; when a buffer stock reaches the maximum pre-set level, the upstream indicator indicates the stopping.

Total preventive maintenance (TPM): the workers carrying out the usual maintenance of the equipment to detect the anomalies. The focus is changed from the distribution of the malfunctions to their prevention; the continuous reduction of the installation time.

The total quality management (TQM): a system of continuous improvement using the participative management focused on the needs of the clients.

5S: is concentrated on the efficient organisation of the workplace and of the standardized working procedures (Seiri, Seiton, Seiso, Seiketsu and Shitsuke) and is a set of functions set to systematically organize, clean and standardize the job work, improving productivity and eliminating issues of quality and work safety.

The 5S process includes 5 steps:

1. ***Seiri*** (Sorting) - the first step of the process concerns the release of work space and the removal of all unnecessary materials and objects (eg programs, test pieces, drawings, obsolete or out of order tools, accessories, disused materials, etc.). Sorting has impact on the level of people's mentality, which must give up the habit of gathering and preserving materials and objects.

2. ***Seiton*** (Stabilization, Order) - the second step of the process refers to the efficiency and reduction of the time required for access to the equipment and the work tasks accomplishment and consists in storing the useful elements in a previously established location, a logical order to facilitate their use, to be easily accessed or brought back to the same place as quickly as possible. Fixed locations such as modular shelves, standardized and visibility cabinets, panels, floor markers for access ways, containers for all commonly used materials and tools should be established, storage being made according to the frequency of use. If everyone has quick access to any element or material, workflow becomes more efficient and, as a result, staff becomes more productive.

3. ***Seiso*** - The third step of the 5S process is to clean the workplace (floor, cars, cabinets, etc.), making it "shine"; cleanliness must be done by every person, regardless of their position in society. All spaces that form a job must be cleaned, without exception, so that any deviation from the order established in the second S can be immediately noticed.

4. ***Seiketsu*** (Standardization) - The fourth step of the 5S process is to define the standards (rules, habits and standard procedures) to which staff must relate in measuring and maintaining order and cleanliness. An important element of seiketsu is visual management. Uniformly and standardized color coding of different elements can be an effective way of identifying abnormalities present in a workplace.

5. ***Shitsuke*** - The last step of the process is discipline and observance of the previous 4S, assuming the common will of all personnel to keep order and practice the first 4S as a current way of working; Shitsuke's foundation is to eliminate bad habits and generalize good practices.

5S is not an activity for a few weeks, and the advantages of the method only occur when all five S are applied.

The benefits of 5S translate by productivity growth due to product and process quality increase, eliminating tool searching time, reducing machine stopping time, faster problem identification; improving workplace security; quickly identifying products or jobs with nonconformities; improving employees' moral, introducing best practices, promoting better communication at work, delegating workplace improvement responsibility.

The LEAN production tools are a support for human resources first of all but also for the benefits of the company; they can be used for a better perspective of the companies, for a prosperous future, for a longer period of functioning.

4. LEAN site at Renault

The continuous progress the maturity of the practices of the Renault Production System strengthened with the current management and the Kaizen management points out a maturity in the reduction of the lack of added value The result of this continuous progress supports passing to a new stage – the rupture project in competences and objectives (the LEAN project), representing a high performance industrial scheme looking to eliminate all waste resources.

Lean involves making decisions based on facts and real data, not on their own intuition and opinions, it is a system of indicators that can help senior management to make the most effective decisions based on the analysis of data and information, i.e. objective evidence, obtained by observing, measuring, testing, along with other sets of appropriate quantification and estimation methods.

Lean indicators should be carefully chosen in a restrictive sense because they need to be few in number, expressed in readily understandable, quantified and measured physical quantities (daily, weekly, monthly, yearly), process oriented and intended to be used by production staff and by management, but easy to understand and common for all production operations and most departments (example of indicators: production, cycle time, ratio between value added and total costs, manufacturing duration, productivity labor, cost of scrap, etc.) as much as possible.

The LEAN site can be found on the top of the "racket" of the Renault production system.

The main objectives of a LEAN site are:

- MOBILISATION around a rupture;
- a PROJECT MANAGEMENT in order to succeed in the process of solving the problems;
- GLOBAL VISION of the losses in an industrial system, the ability to measure and to organise their eradication in order to meet the goal.

The structure of a LEAN site, the 4 boxes:

- Current results;
- Results to be reached;
- Current way of functioning;
- Future way of functioning (see fig.4/ fig.5).

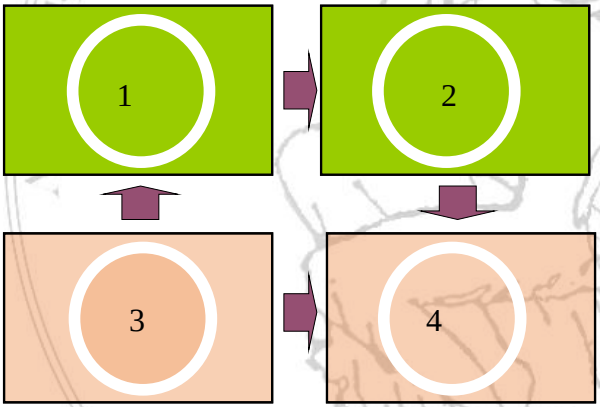

Fig.4 - The 4 boxes allow you to see the differences between the actual results and the expected results.

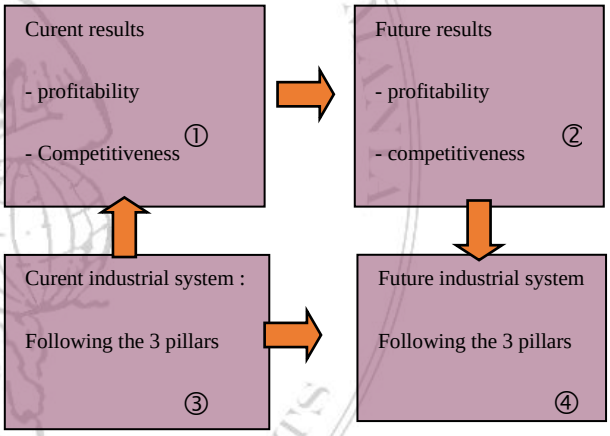

Fig. 5 The four boxes – staging steps

Activities aiming at a project structure (stages of the LEAN project):

Initialisation – Involving the directing committee; developing the decision matrix;

Employment - Interviews; the commitment plan; communication plan;

Diagnosis – Characterisation of the Industrial System according to the 3 pillars (the transfer mechanisms; the workshop management mechanism); building the 4 boxes;

Analysis – Distributing and validating the cases of the root of losses; action plan

Piloting – Project revisions; revision of the gained earnings/expected earnings;

Closing - 4 final detailed boxes; reaching results; capitalisation.

All these stages are taking places on a significant period of time 8/ 12 months.

Creating a standard group:

Leader – is the warrant of the end results and of the successful conditions;

Project manager- coordinates and takes decisions along the project;

Experts – bring their contributions methodologically **allowing the project manager to make decisions**;

Participants – representatives of the various organisational structures (maintenance, logistics, quality, engineering etc.)

Economic validator – validates the earnings from an economic point of view.

Job Abilities:

Problem solving method - a problem is a gap between a real and an expected situation;

Losses searching method following the 3 pillars:

Transfer mechanism – characterising all the elements related to the transport of parts, including the aspects related to information and programming;

Transformation mechanism – characterising all the elements related to the design of the means and the implantation of the people/machines;

The mechanism site management- characterise all the elements related to the management of people and of the standards.

Loss „everything for which the client is not willing to pay".

Losses were grouped initially in 7 categories:

1. ***Overproduction***: manufacturing products before being requested by the client (stock) or processing information which are not necessary (for example products or forms or data which were not requested or are not analysed);

2. ***Expectations and inactivity***: lack of tools, materials, information on the necessary moment or waiting to process a large lot from which the client only asks for two products;
3. ***Useless transport***: unnecessary transfer of the product, person or information in or from store between processes, on too long distances;
4. ***Useless process***: to produce a certain level of quality with more operation than necessary in order to meet the requirements of the client, using sophisticated equipment of tool when the simple ones would be enough, processing information in a more complicated way than usual, having longer sessions with the staff than the programmed period;
5. ***Operations without any added value***: maintaining the material stocks, unfinished production or finished goods on an excessive level in order to compensate the manufacturing mistakes or other losses during the processes; not using the entire production capacity of the stud, the creativity and the power of thinking;
6. ***Useless measures***: appear when there are no preoccupations for ergonomics – additional movements in order to put/take an object in/from the working space or negligence in a succession of movements to perform an operation;
7. ***Malfunctions, corrections, reparations or reprocessing:*** Any activity of correcting the design or execution mistakes detected after their appearance.

After they are noticed, the losses are a potential of improvement! The analysis of the causes might attract the staff of the organisation to supply more ”value for the client” and it is not enough to ”punish” the guilty.

Conclusions

In this developed stage of productivity, workers should take the advantages of modern science, the technologic management and the information platform and fully use the technologic orientation information and the analysis function of the decisions, to improve the management processes so that they reach the ideal in the production process and to promote the development of the industrial level.

Secondly they should grant full support as for example a diversity in the industrial technology in the field of information, extraction, classification and use of the industrial data, so that they could setup the bases to put into practice the technological information and to finalise the construction of the intelligent manufacturing site.

The general ideas for an intelligent manufacturing workshop cover the real production of the enterprises, businesses involved in production, logistics, management and maintenance. The intelligent manufacturing workshop is using the advanced technology information including visualisation, transparency and intelligent network along with the capacity of balance in the system, the online monitoring of the production equipment, the usage efficiency in order to increase the quality of reducing the production costs and for a better efficiency of the production of the enterprises.

In order to accomplish the automatic functioning or in order to reach the pilotless stage (the low intelligent production) the workshop looks at the informatic system as a platform, the visualisation as transporter and uses the integration of the IT informational infrastructure and production, the process to se a series of network business in order to obtain all the aspects of the standard production process and the uniform interface.

The enterprises build an intelligent production workshop by research and application. The workshop reaches the automatization, independence and intelligent operation objective with the support of the digital technology, improving the ability to plan and coordinate the operation process of the workshop, programming and the level of security of the resources.

The usage rate of the equipment is high from 40% to 60%, the efficiency of processing is improved with more than 20%, growing significantly the production capacities from enterprises.

In building an intelligent manufacturing workshop, digitalisation might be a precise element (programming and controlled production); the methods can help the analysis of the data and finding problems, supplying with improved means. The interaction between the two offers a research and development system, production and service for the development of the enterprises.

Implementing a Lean site aims to increase performance in the sectors concerned (15% DSTR reduction; Design Standard Time Ratio – represents an indicator of Renault-Nissan Alliance - which includes direct operations, control and retouch operations, logistics operations, breaks and manufacturing stops), improving ergonomics in workstations, improving quality, improving Overall Performance Plant, implementing new waste disposal areas to easily maintain benchmarking, implementing new technologies in manufacturing lines (automation/robotics).
A project of rupture aims at reducing losses and non-added value and respects a rigorous planning, divided into 6 stages: Initialization → Engagement → Diagnosis → Analysis → Pilotage → Closing.

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