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APPLICATION OF PROJECT MANAGEMENT AND CONCEPTS OF LEAN MANUFACTURING IN THE INDUSTRIAL BOILER SECTOR

Leonardo Finoti Moreira

<http://lattes.cnpq.br/7245648225745933>

Maria de Lourdes Martins Magalhães

<http://lattes.cnpq.br/0697937152836099>

Marco Antonio Greco

<http://lattes.cnpq.br/8946169248321120>

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Abstract: In search of technological innovation, it makes industry sectors to review with some constancy, its internal manufacturing processes, in order to optimize the manufacturing time and the direct or indirect costs of its activity. Over time, the mechanical industry has shown itself in a significant and highly relevant way for the development of the economy. The industrial boiler in Brazil is closely linked to the demand for large projects, making the need to project and manufacture equipment in the country. This way, research for innovative practices and tools that, when applied correctly, promote significant changes in projects. Project management is the application of knowledge in the activities of a project to meet its requirements. Project Management Body of Knowledge (PMBOK) is a Guide to Project Management Best Practices prepared by Project Management Institute (PMI). The approach of management procedures listed in PMBOK occurs so that its application occurs during the project life cycle, where project management processes, besides interacting with each other, also interact with areas of knowledge such as Lean concepts Manufacturing. Thus, the objective of the present work is to apply a project management methodology together with the concepts of Lean Manufacturing in a partner company in the industrial boiler sector, located in the municipality of Santo André-SP, according to PMBOK, in order to Promote results in terms of productivity and profitability. It is noteworthy that, with the introduction of new technologies, better results are obtained, providing greater gains and lower risks to the project, raising the company and its products to a level of higher quality and success.

Keywords: Boiler; Lean Manufacturing; Project management; PMBOK.

INTRODUCTION

The search for excellence in organizational processes, motivated by the need to create products that present to the market something differentiating and add value to the result in conjunction with the cost minimization view and maximization of profitability.

Caldeiraria is an area of the mechanical industry that operates with iron parts and steel molded to satisfy metal structures manufacturing projects. Thus in this scenario, companies can meet a great diversity of industrial segments.

Thus, it is necessary to search for innovative project management and tool management practices such as Lean Manufacturing that, when correctly applied, provide improvements in projects. Thus, the project is justified by the insertion of a management that meets this demand in an industrial boiler company, promoting management that minimizes the risks of the process and maximizes opportunities from a successful perspective for the company and for stakeholders in the project.

The partner company of this work, in the application of project management in the industrial boiler sector, has over 20 years of experience, projecting from various products and equipment, supporting its engineering services, developing and improving its manufacturing processes, With technological innovations, in order to meet the needs of your customers always presenting the best engineering solutions.

In this context, the objective of the present work is to apply a project management methodology to a partner company in the industrial boiler sector, located in the municipality of Santo André-SP, according to PMBOK, in order to increase the results in terms of productivity and profitability.

INDUSTRIAL BOILER

The industrial boiler sector has been presenting over the years, a major contribution to the development of society with high efficiency, quality and complexity equipment, serving the most diverse segments of industry such as petrochemistry, steel, aeronautics, naval, Nuclear, pharmaceutical, and so many other important segments for industry development.

Due to the needs demanded by increasingly challenging projects and technological advances in an increasingly competitive world, requiring highly qualified professionals to perform extremely challenging activities. As a consequence, it becomes paramount to the search for training and development in the training of professionals in order to increase important expertise, and thus increasing the capacity of competitiveness and the growth of national industry, reverting to society a better quality of life.

PROJECT MANAGEMENT

The increase in competitiveness in the industrial sector has motivated the development of techniques and methodologies for process analysis, control and improvement (SILVA; AMARAL, 2011). Industrial boiler is a sector of the metallurgical industry that is responsible for the production of metal parts, used to assemble various types of equipment and industrial structures. In this context, the search for new techniques and tools that make productivity, quality and profit of the product become a relevant factor in the current scenario.

According to Project Management Institute (PMI) (2017), a project is a temporary effort used to create a unique product, service or result. Thus, the project has a defined beginning and end, where the end is configured through the objectives are or not met.

The project has some characteristics, such as: having uniqueness and specificity; point out temporary activity, with a defined schedule and punctual tasks with logical and progressive sequences; present limited resources (KERZNER, 2011).

PMI (2017) exposes the project's life cycle as a series of phases that the project travels from the beginning of the closure, defining the phase of a project as a set of logically related activities that culminates in the conclusion of one or more deliveries, with the possibility of sequencing, interactivity or overlap of them.

According to Slack et al. (2007), a project production system involves several non-repetitive activities, which leads to greater concern, given the peculiarities inherent in each project.

In this sense arises the need for project management, in order to apply an orderly approach to such activities with a specified time and budget result.

Thus, PMI (2017) defines project management such as the application of knowledge, skills, tools and techniques to project activities to reach the final product in meeting its requirements.

Thus, when well employed, project management contributes to the fulfillment of the project objectives and to meet the expectations of stakeholders. Even when there is a need for project changes due to the contracted parties or due to external factors, management demonstrates the ability to adapt to the different circumstances, concerns and expectations of stakeholders, minimizing unforeseen events and impacts.

Project Management Body of Knowledge (PMBOK) is a set of project management practices, organized by PMI and indicating a basis on which organizations can create methodologies, policies, procedures, rules, tools, techniques and phases of the cycle

necessary life for project management practice.

Each phase of the project presents its own life cycle, with input processes, tools, techniques and exits that are present in five groups: initiation; planning; execution, monitoring and control; Closing. At the end of each phase the project performance is evaluated with a view to the possible continuation.

According to PMBOK, project management processes, besides interacting with each other, also interact with ten areas of knowledge, where each area is identified according to their recognition requirements and their process characteristics that compose it: management of Integration of the project scope project; project schedule, cost, quality; Project resources management, project communications; risks, acquisitions and stakeholders of the project.

The concept of Lean Manufacturing can be defined as a management that seeks to optimize the processes of an organization, resulting in answers to customer needs in a short term, with high quality and at more competitive cost. In addition, there is an increase in safety and morality of all parties involved of the organization.

Other areas may still be listed in project management. However, some areas are traditionally treated: scope, time, costs and risks, which leads to maximization of the organization's results.

SCOPE MANAGEMENT

According to PMBOK, scope management includes the processes necessary to ensure that the project includes all the work, and only the necessary, to be successfully ending. In addition, it is mainly related to defining what is and what is not included in the project.

Scope management processes include, but are not limited to:

a) Plan Scope Management: Process of creating a scope management plan, capable of documenting how project scopes, being a product and/or service will be defined, validated and controlled.

b) Define the scope: process of detailing the project development phases,

c) Create the analytical project structure: EAP, generating the organizational structure of the project, generating a traceability matrix, physical and financial schedules, so that both happen simultaneously and in harmony, thus avoiding a possible lack of human resources and financial.

d) Control the scope: Process of diligent the status of the project, product and/or service scope according to the project requirements, and already pre-established agreements, managing the changes that occur, in order to not cause the relationship of Project deadlines and costs.

SCHEDULE MANAGEMENT

According to PMBOK, the management of the schedule is carried out by establishing policies, procedures and activities for the schedule through the project network diagram, including dependencies and interactions between these processes, essential entries and exits, and statistical tools to estimate the duration of activities.

The act of estimating the time elements for each task is essential to maintain the predictability of the final project delivery date. Once the time of performing the tasks is estimated, it is possible to make adjustments to the activities provided for in the project scope.

Usually we called this time management, but to run from time, it was observed that the time is not managed, but the need to have something within a period with a pre-established end time.

COST MANAGEMENT

According to PMBOK, project cost management is mainly concerned with the cost of resources needed to complete the project activities. Project cost management must consider the effect of project decisions on the subsequent recurrent cost of use, maintenance and support of the project, service or project result. For example, limiting the number of design reviews may reduce the cost of the project, but could increase the operating costs resulting from the product.

RISK MANAGEMENT

According to Kerzner (2002), risk management is the process of identification, quantification and response to project risks without any material impact on project objectives. Thus, it is expected that in the coming years companies will integrate more of their business processes with the project management methodology as shown in Figure 1.

METHODOLOGY

The project methodology needs to be known and applied by the parties involved in the management of the project, no matter how much the necessary resources are, and we do not have the clarity of the objectives defined and the motivated team, the project will most likely be subject to major difficulties, and can Risk of not being successfully completed, because the focus is always on the customer, but the professionals involved in the project, come before the customer, because without a prepared and motivated team, there will be no successful project, and in the near future, there will be no client either. In this context, the biggest asset of a company is, and will be, its employees who are actually its largest business partners.

In order to demonstrate through data, the direction of the present work, the company's

maturity was made according to Figures 2 3, through the website www.maturityresearch.com.

Thus, after a meeting with the company's general director, and a visit on its premises including the factory, it was possible to identify some opportunities for improvement, prioritizing those that in a time of economic crisis due to Covid-19 pandemic, could generate great results, minimizing risks, expanding financial gains, market competitiveness opportunities, and at the same time, injecting low investment cost, whether financial or personnel so that the project would obtain economic and financial viability in its implementation to Apply the 5S program steps to contribute to the structuring of the strategy adopted as described in Figure 4.

Thus, implementing efficient actions in the application of project management, such as good manufacturing practices, including a well -applied knowledge structure, skills, tools and techniques, and easy to understand by the entire company team

Thus, even if the participation of some initially were not directly directly in the implementation process, but over time, they would also be able to absorb and pass on the acquired knowledge, thus changing their culture in the way of making certain activities. This obtains the minimum resistance to such changes due to process improvements.

LEAN MANUFACTURING AND THE MANAGEMENT CONTAINED IN THE PMBOK

By applying the concept of Lean Manufacturing which basically consists of wipe out production processes, that is, having lean processes, as well as associating with the most diverse management contained in PMBOK, you get powerful tools inserted in the company to achieve

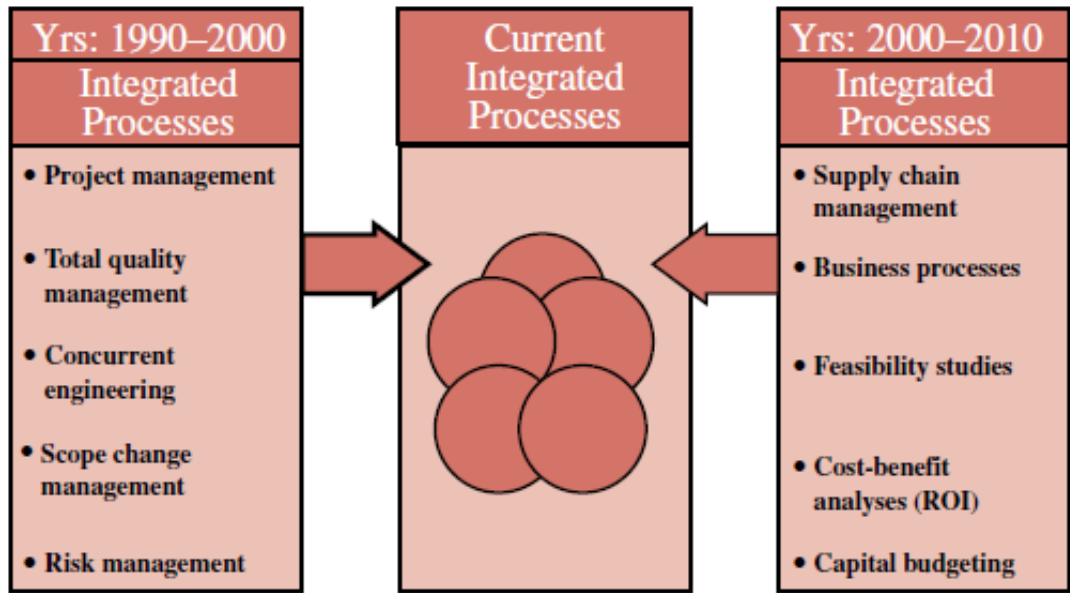


Figure 1– Integrated processes (past, present and future).

Source: Kerzner, 2002.

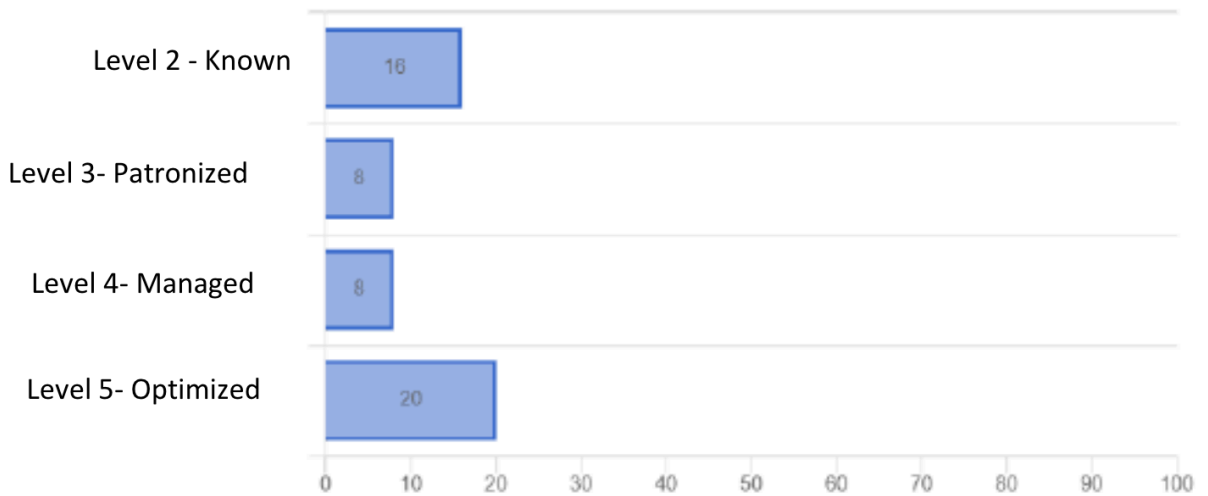


Figure 2 - Score by level.

Source: Prepared by the authors

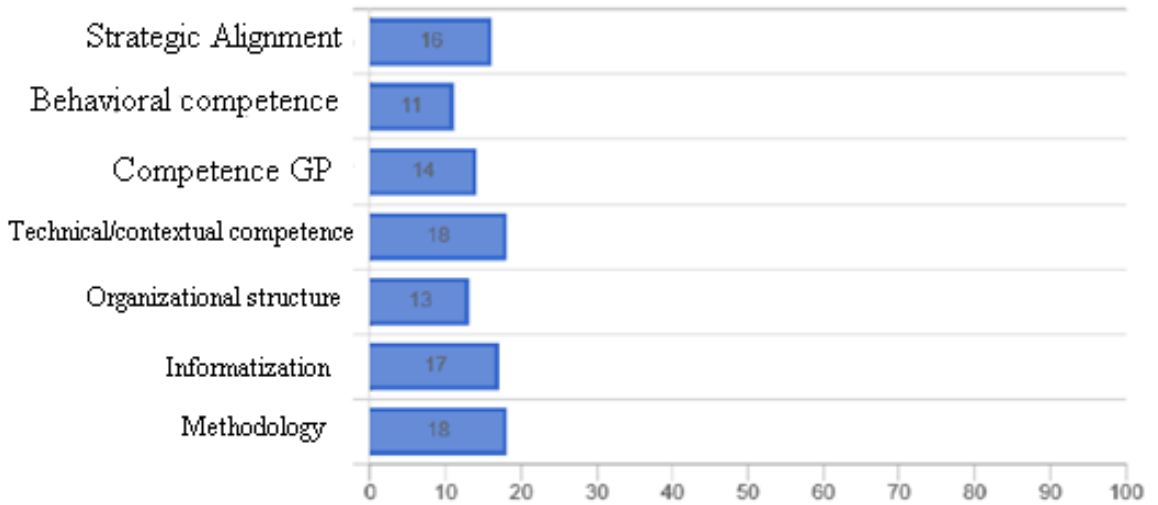


Figure 3 - Adherence The dimensions.

Source: Prepared by the authors.

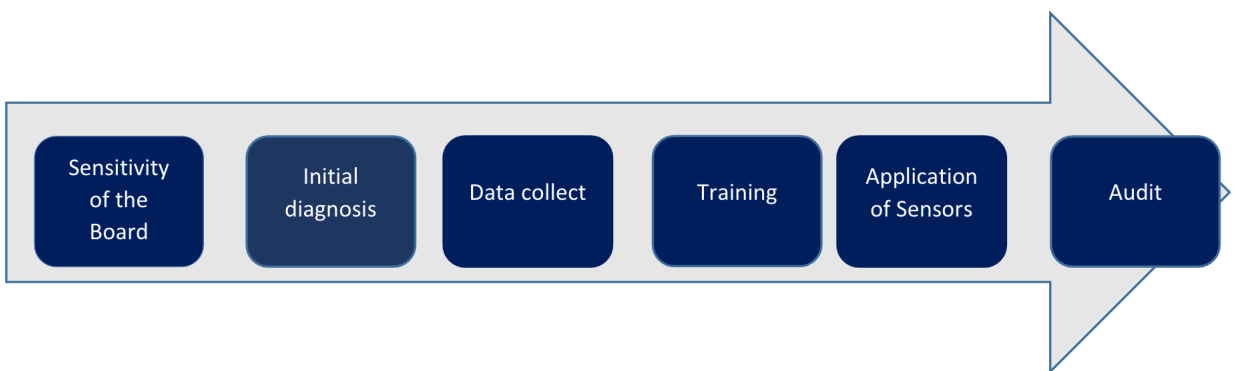


Figure 4 - Application of the 5S program steps.

Source: Prepared by the authors.

better Performance, whether in production time, product quality, costs integrated with processes. Thus, consequently financial gains are leveraged by the results obtained due to the efficient application of the tools, and it is also obtained as a large added value to the company a culture of continuous improvement of processes where it can be observed throughout this work.

RECEIPT AND STORAGE

By adopting a receipt inspection, both in materials and in the certificates received, they are guaranteed that the necessary

requirements established by engineering based on technical and project standards are ensured to maintain the quality required and required.

Upon approval of the receipt inspection, the materials are preserved, stored and properly identified with the company's internal parts numbers. Maintained in stock until the receipt of a service order issued by the manufacturing planner, so that they can be available at the correct time of their use in the manufacture or assembly of equipment. As described in figure 5, it is possible to clearly understand this process.

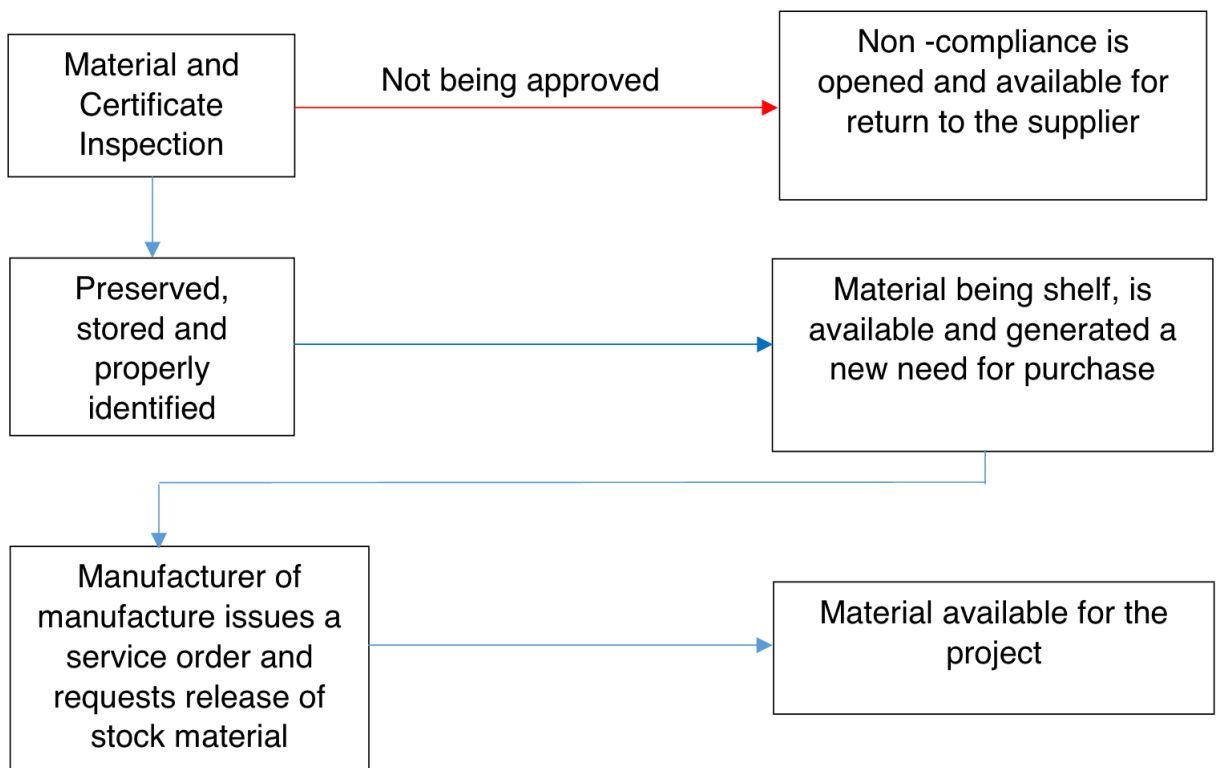


Figure 5 - Receiving and Storage Flowchart.

Source: Prepared by the authors.

MATERIAL MANAGEMENT

A code of material was created for each item and were inserted into a family of materials such as cables, connections, tubes, bar, valves, among others. Once such a structure made, they were inserted in the main structure of the built equipment, as shown in Figure 6. Thus, it was possible to obtain more efficient cost management, deadlines and reduce the risk of material lack during the equipment manufacturing process.

Within material management, it becomes necessary, in addition to having the materials properly identified, preserved and easily organized so that the moment they are requested by the manufacturing planner are easily accessible. Thus, both the physical system and the computerized system must be compliant with each other, ie it is paramount that it is periodically made an inventory in the material management systems, avoiding loss of productivity for a possible lack of material in the Stock physicist, idleness of collaborators, delays in project schedules and

even in some cases purchases of unnecessary materials, due to the material physically but not informed in the system.

In both cases, costs were detached that could be avoided when making periodic inventories. Thus, by applying the concept of 5S as a daily practice as the cycle in Figure 7 can be observed, there is then a search for an improvement continues in the processes.



Figure 7 - Application of 5S.

Source: Prepared by the authors.

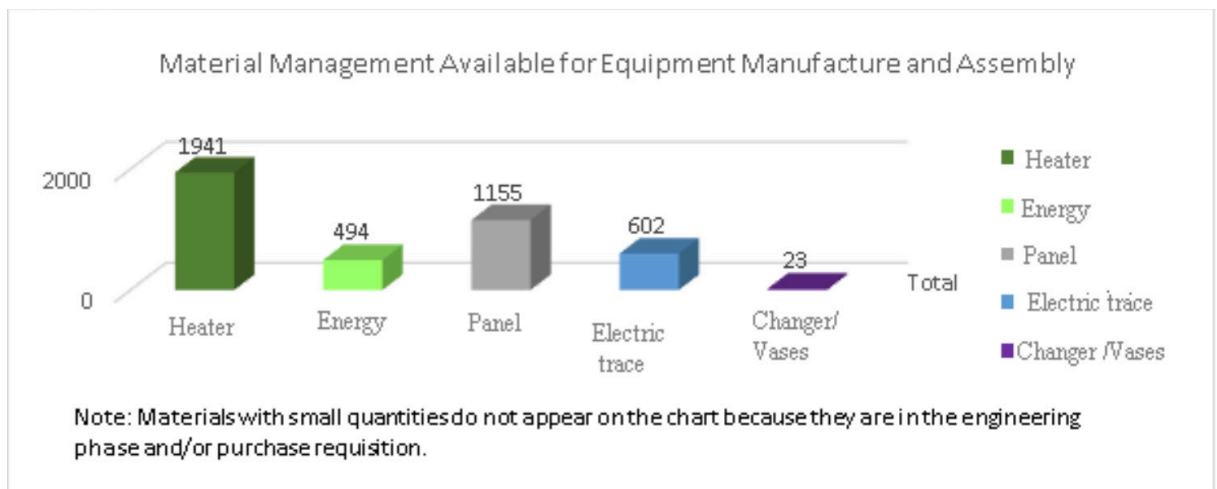


Figure 6 - Material management available for equipment manufacturing and assembling.

Fonte: Elaborado pelos autores.

PROJECT STRUCTURE

When seeking more efficient results within the management of projects in industrial boiler, project structures are created, where they are able to serve not only the manufacture of equipment, but also assertively manage the most diverse phases contained within the schedules, whether they, physical, financial, raw material, engineering documentation, date book assembly including inspection and testing reports and normal operating costs for the proper progress of the project.

According to the financial cash flow and opportunities in searching investment by the company, you must seek tools, capable of generating management reports that assist in decision making and monitoring the project schedules. Where such reports have relevant information as some demonstrated below:

- a) Client;
- b) Project name;
- c) Equipment type;
- d) Dates of the main manufacturing and financial events;
- e) Deadlines that need a reprogramming on the planned. Emphasizing that not always a reprogramming, will result in a delay in the manufacture schedule and consequently, the delivery of the equipment;
- f) Raw material traceability and components used during manufacturing along with their certificates;
- g) Data from where the raw material and materials were acquired for manufacturing;
- h) Notes to win with the customer;
- i) Notes to win to your Supplies;
- j) Cash flow;
- k) Monitoring the operating cost of the company and the manufacture of equipment, analyzing if there is, or if there will be, a deviation in the planned cost for the project;

Control tools can range from Excel and its macros, Gantt Project and even advanced and renowned software that are used by large companies. The choice must be given, according to your needs x applicability x financial conditions for the acquisition, ie, the cost-benefit ratio must be due to the company and the project. It is noteworthy that in the proposal and planning phase, such items must be observed so that there is no unforeseen unforeseen events, as some large companies require in their contracts that certain project reports are made in specific software such as engineering and project control.

As shown in Figure 8, it is necessary to elaborate, and make known the flows of the processes within the company. Thus, knowledge is absorbed in a simple and more natural way, as well as providing certainty to the company's managers that everyone will be able to follow the necessary processes for the smooth running of projects, with quality and efficiency demanded by the present times.

In this context, it is observed that the more we seek to know the processes that the good practices inserted in the concept of Lean Manufacturing associated with the application of project management within the company, one can develop methods of improving continuous improvement, and risk optimization and failures during the progress of the project.

CONCLUSION

After analyzes of the applied methodologies, this study showed, the effectiveness of applying project management with the concepts of Lean Manufacturing within the industrial boiler sector, using processes that provides the company, better results in the manufacture of its equipment and financial.

The study demonstrated a cost reduction by knowing and applying best

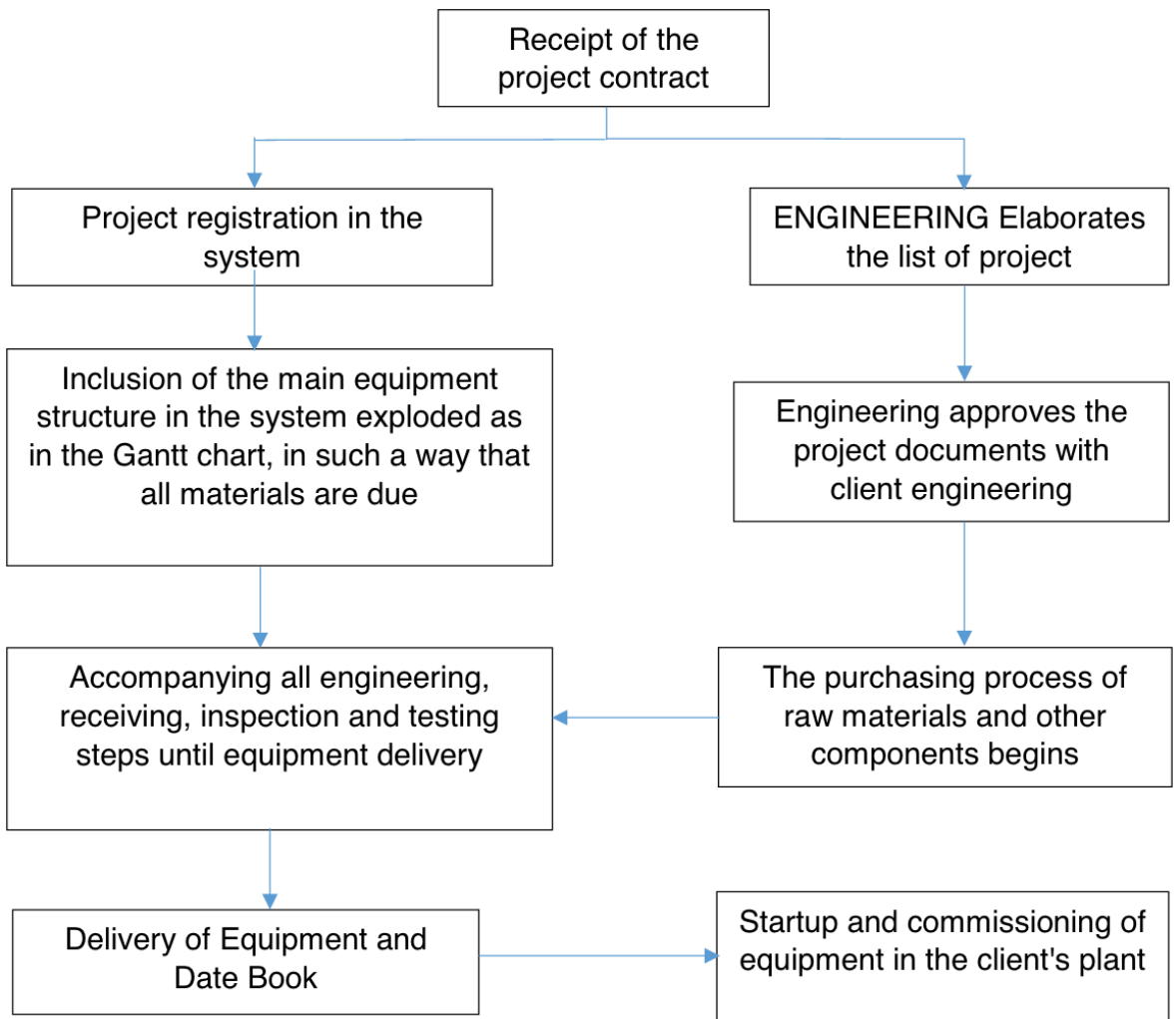


Figure 8 - Process flow structure.

Source: Prepared by the authors.

manufacturing practices, reducing the risks that all engineering projects have within the boiler, by developing high -tech equipment, performance and complexity of development due to challenging conditions imposed by modern society and its increasingly covered and demanding needs for more affordable efficiency, quality and costs.

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