SOLID FUEL SYSTEM OF ARCELORMITTAL TUBARÃO[1]

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Abstract
The objective of this work is to present the solution developed in ArcelorMittal Tubarão for the hiring and accompaniment of solid fuel shipping. The context that required the development of this work will be presented, as well as the challenges and the problems of the business and the gains brought by the solution. The main business processes flows will also be described in order to highlight the way the proposed solution works for each of them.
Key words: Solid fuel; Contract; Shipping.

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INTRODUCTION

The goal of this work is to present the solution developed in ArcelorMittal Tubarão[1] for hiring and accompaniment of solid fuel shipping.

Hiring means the maintenance of the contracts that establish clauses, values and obligations between the hiring company and the suppliers involved in the shipping of solid fuel, thus treated simply as shipping, weather they are of material, transportation or discharge services.

The accompaniment of the shipping corresponds to the management of all its information, since its creation, effectuation, loading and discharging of material, until the accomplishment of the contractual commitments taken by the investors.

First, the initial sceneries and the challenges that led to the need of developing this work will be presented. Then, the methodology will be discussed, highlighting the business processes[2] involved.

After that, the characteristics of the developed system will be presented, as well as the results of its use. The discussion of the results will be based in the listed challenges, showing how the known problems were addressed.

Finally, in the conclusion, some considerations about the operation of the production system of ArcelorMittal Tubarão will be presented.

1 Contextualization of the work

With the realization of the productive capacity expansion project of ArcelorMittal Tubarão to 7.5 million tons of steel a year, there has been a raise in the solid fuel demand of almost 60%, going from the current 3.8 to 6.5 million tons. At he same time, the consolidation of the ArcelorMittal Brasil group, which gains the know-how of ArcelorMittal Tubarão when it comes to purchasing of solid fuel. Therefore, ArcelorMittal Tubarão starts to be significant in purchasing solid fuels for ArcelorMittal Brasil group.

This significant scenery alteration not only increased the volume of work, but also created new business needs. Facing this, it was necessary to develop a system that could facilitate the maintenance, evolution and adaptation to eventual new needs of the company business.

Challenges

To compose the shipping of solid fuels it is necessary, at first, to establish the material items that will be transported, as well as its suppliers. It is also necessary to establish who will be responsible for the transportation, which is usually by sea, and for the discharging services.

Each one of these activities is supported by contracts that specify clauses related to deadlines, values, what can change those previously agreed values, the establishment of quality patterns of the materials as well as the criteria to calculate rewards or penalties when they are not like the agreed pattern.

The contracts also specify which documents must be sent to the suppliers and other service companies and establish deadlines for receiving those documents. Some documents examples are material and transportation invoices, physical-chemical analysis and statement of facts of loading and discharging ports. Receiving those documents is a condition to calculate the costs, which normally are in the

dimension of millions of dollars, and have their payment date also established in the contracts.

Those specifications are not supported by the traditional ERPs. Reward and penalty generator clauses due to poor quality are examples of that. Those clauses are based in the values accorded considering the physical-chemical characteristics of the solid fuel. When the material presents a higher or lower quality rewards or penalties are applied, and their values are based on percentuals over the quality difference or on formulas that are calculated according to the physical-chemical analysis.

The other contracts present other specificities, each one influencing different aspects of the shipping. Therefore, maintaining the specificities and obeying the contractual clauses are important challenges for the business.

Some business process flows, like the ship nomination, involves the participation of almost everyone involved in the shipping. There is also an intern communication flow between the business areas of the company. Normally, the cost to establish the communication is high and it is done through informal ways, like phone calls and e-mail. Therefore, the automation of those communication flows, granting the integration of every involved part and the consistence of the business is another important challenge.

The use of many artifacts for accompaniment of the shipping is another recurrent problem of the business. The decentralization of information, which is kept in electronic sheets, documents and e-mails exchanged between company and suppliers, makes it difficult to handle the business and to make quick decisions.

Another problem is that the knowledge remains with the people, since some amount of the information is not transformed in knowledge, weather it is described in e-mails or in other documents exchanged between the parts.

This situation affects the respect for the contract's deadlines, since it is not always easy to define the real shipping situation. This leads to a work flow focused in emergency attending, not giving the opportunity for the involved people to organize themselves in a way so that the work can be done respecting the deadline and with a bigger autonomy.

Therefore, other challenge for the success of the business' activity is to centralize the information and make it available for quick analysis and decision making.

2 Methodology

The primary concern was to establish a master line of the hiring business process and of the shipping accompaniment. For that, state diagrams that showed the general high level behavior of shipping and contracts were designed.

In a second moment, each state transition was studies more deeply, establishing new diagrams and processes flows, which represent the many interactions between companies' areas and extern collaborators that compose the business.

When possible, parts of the existing processes were reformulated, looking for make them more flexible or more coherent with the new business trends, opportunities and needs.

The shipping state diagram is represented in Figure 1.

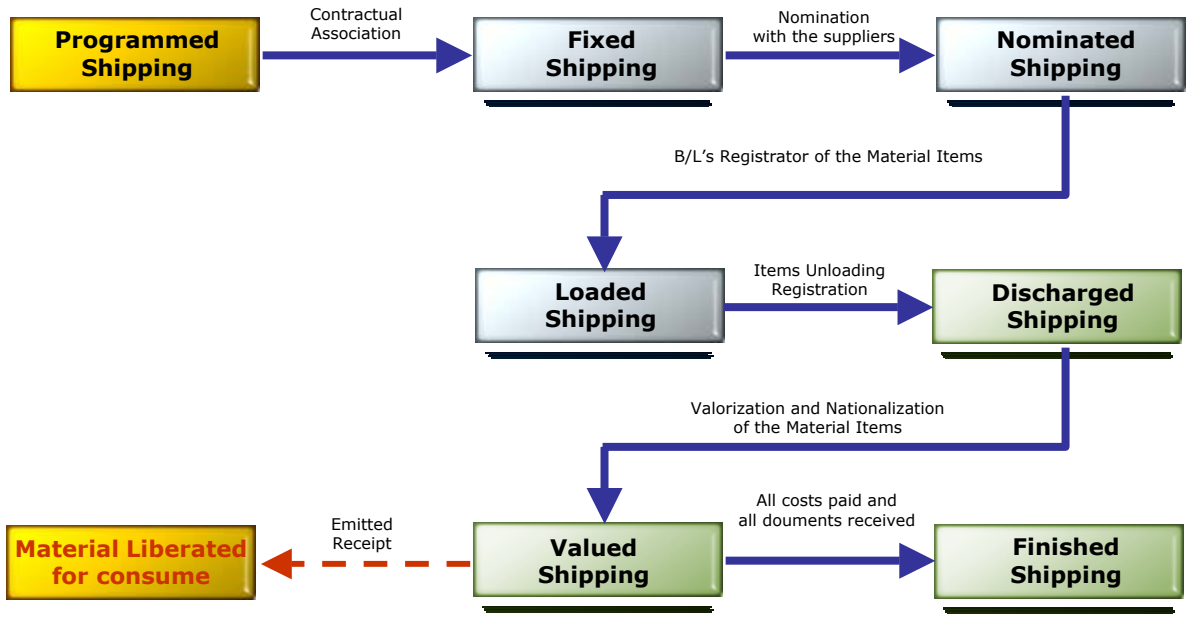

Figure 1 – State diagram of the shipping.

Initially, the shipping is Programmed, being established dates and items to be loaded and discharged. Once the associations with the contracts is established, the shipping is Fixed, which means that dates and items predicted start to be a part of the production planning of the company.

Then, the nomination of the ship happens with the suppliers, and, in the end of this process, the shipping happens in its Nominated state. At this point, the material suppliers assure to have the solid fuel available for loading, and the loading and discharging ports assure to be available for the future activities.

After the loading, defined by the emission of the B/L, of all the material in the many loading ports in the route, the shipping passes to the Loaded state. In a similar way, after the discharging of the material in the discharging port, the loading passes to the Discharged state.

Once the process of nationalization and valorization of each material item is finished, the shipping becomes Valued. At this point, the material items are liberated for consume after emission of the receipt. After all the costs have been paid, all the documents have been received and all other obligations have been followed, the shipping is Finished.

As mentioned, this is the general high level pattern followed by any solid fuel shipping. Many processes flows occur in a complementary way, composing each one of the shipping states transitions.

As a previously mentioned example, the nomination process of the ship used in the shipping is one of the most interesting flows and also the one that requires the biggest communication effort between the involved parts. Figure 2 represents the state diagram of this process.

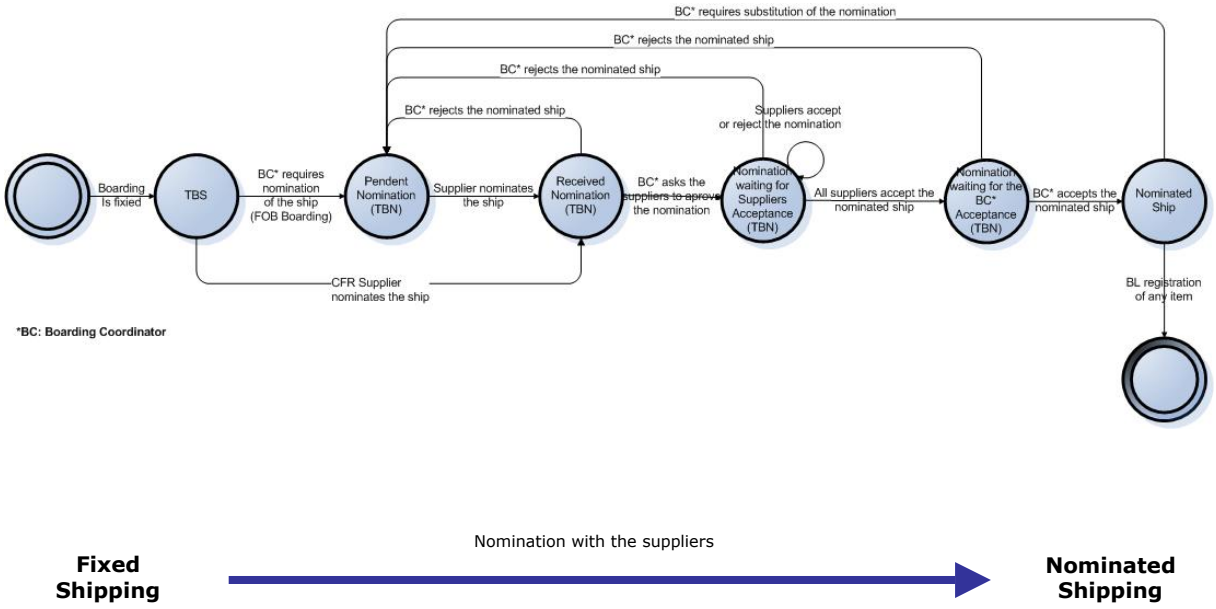

Figure 2 – State diagram of ship nomination.

Once the shipping is Fixed, its nomination should be required (TBS) by the shipping coordinator for the shipowner. The shipowner defines a ship and its characteristics and sends those definitions to the evaluation of the coordinator. Once approved by the coordinator, he sends those definitions to the evaluation of the others suppliers. After all the suppliers have accepted the nominated ship, the shipping becomes Nominated.

Some process flows happen at the same time, independently of each other in the state transitions, being possible to demand interactions between company business areas and extern collaborators. As an example, Figure 3 presents the importing modality definition process, the payment way definition and the actualization of the trip data, which are made, respectively, by the importing area, financial area and the shipowner.

It is necessary to highlight the importance of the trip data accompaniment, because they report weather the shipping was late or not. Those data refer to arriving, start an conclusion of the operations in a certain port, as well as the prediction of those dates in the next loading or discharging port. Those data support the decision making in key areas of the company, mainly the production area.

Other flows, not less important, compose the many shipping state transitions, for example: The information register of laytime in the port, the information register of physical-chemical analysis of the material items, the acceptance of documents, the accompaniment of the payment, the accompaniment of the nationalization process, among others.

The contracts involved in the business also had their main flows mapped. Basically, a contract has its clauses edited in two moments, when it is being Created and when it is being Revised. A Revised contract is another version of the initial contract, in a way that it can be compared in any moment to its previous version.

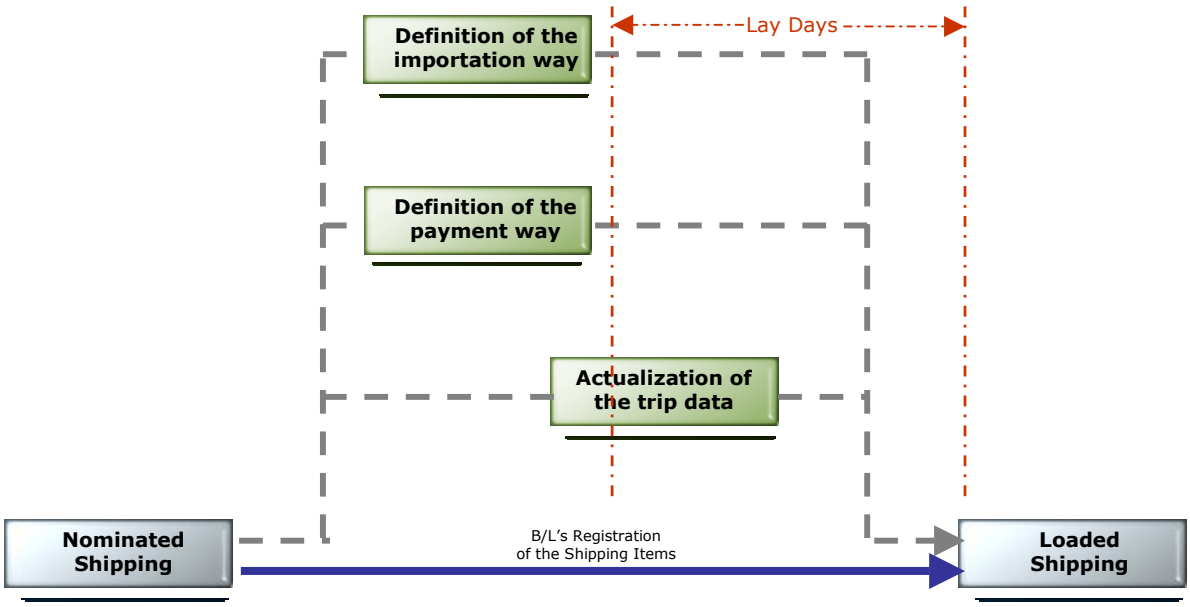

Figure 3 – Integration between shipping collaborators.

Once the edition stage is finished, the contract is liberated for Management Approval. Once Approved by the manager, the contract is available to be associated to a shipping. The contract can also be Closed or Canceled. Closing means that the contract is over. The cancellation is done when the contract is considered annulled.

It is important to highlight that both the contract approval flows and the shipping costs payment flows respect the values limits that can be accepted by a manager. Therefore, when a manager does not have permission to approve a contract or a cost, the superior manager must also approve. The approval process flow continue until one manager has the permission to approve the value in question.

After the establishment of the main flows of system processes, the development of the system itself started. The result in question, which is the system, is described in the next section.

3 The Solid Fuel System

The Solid Fuel System is the solution of ArcelorMittal Tubarão for the hiring and accompaniment of the shipping. Its functionalities were developed looking for maximum compatibility with the studied processes flows, which represent the know-how of this company when it comes to purchasing solid fuels.

The system was built based on the web platform, using the SOA [3] concepts. Its architecture was structured through integrated modules whose functions are organized according to the activity of each business area involved in the shipping. Therefore, there are modules for the key area, for hiring and shipping accompaniment, as well as for the importing, financial and production areas.

Privately, it was also developed the collaboration module, which is used by the suppliers and services companies involved in the shipping. This module gives functionalities related to the nomination processes and its acceptance, as well as the registration of documents.

The communication and the consequent integration between the business areas and the collaborators is done automatically by the system through the sending of e-

mails. So, every time, in a new phase of the process, that a business area or a collaborator has to actuate in the system, it is warned about that need with the appropriate time.

The organization and availability of each module information in a clear, complete and objective way were also considered, giving the people involved a bigger liberty and autonomy in actuation.

The *Business Intelligence* [4] concept, which refers to the applications and technologies used to gather, organize, analyze, exhibit and monitor a big amount of complex data, allowing the users to use this information in an intelligent effective way, was adopted in the Shipping Board.

It is one of the most important and powerful tools of the solution, since it has the objective to represent graphically and shortly the situation of the shipping events, showing if events that are according to the contract or not. Figure 4 represents a Shipping Board.

Having this information, the involved areas can easily analyze the shipping, attacking the causes of delays or programming themselves for activities that will have to be done in a following stage. Therefore, the Shipping Board represents the solution of the integration of all business information, as well as the quick decision making tool made available for the solution.

Other important tool of the system is the functionality of shipping documents management. With it the documents are organized and available on-line for consultation by every involved area.

To guarantee the traceability of all the operations that are done in the system, a gathering of notes is created automatically whenever some functionality is executed. Therefore, it is always possible to identify the responsible, the date and the context information of a certain operation done in the system, weather it is done by an intern user or by a collaborator.

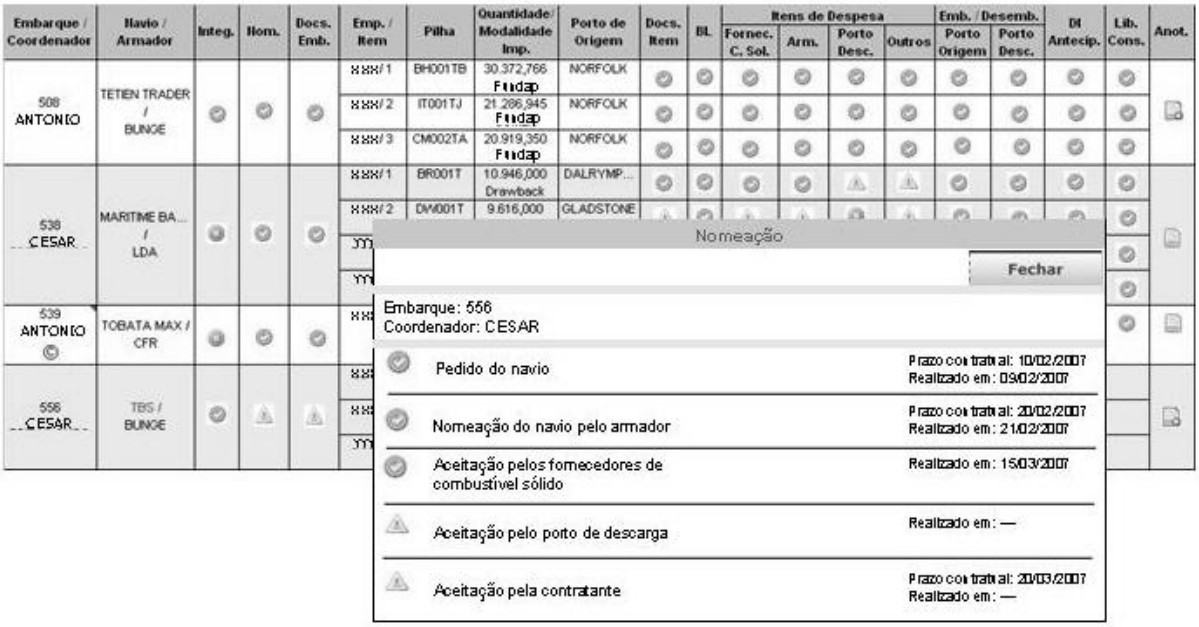

Figure 4 – Example of a Shipping Board screen.

The system also counts with a contract maintenance module that has the objective of maintaining all the kinds of contract used in shipping, as well as its specificities. There are functionalities for contractual revisions management, from the edition to the approval of them. There are also modules that allow the recuperation of historical

information of revisions, making it possible to observe the variations of the contractual clauses, mainly when it comes to deadlines and values.

The solution tried to map all specificities of the purchase business of solid fuel, since the hiring until the accompaniment of the shipping. The non specifics functionalities of the business were treated through interface development for integration with other specialists systems.

For example, the calculus form of the expenses and control of payment is accomplished by the system according to contractual clauses. However, the system is integrated to SAP for sending of the payment information, which is done by this system. After payment, SAP returns these data to the system in order to administrate the acquittance situation of such expenses.

Considering that approach, the solution presents high cohesion, being focalized only in the particular activities of business.

4 Discussion of the results

In this section the aspects developed in the system to attend the challenges and problems identified in the business will be discussed. Also, other improvements that the system brings will be described, defining its positive impact in the business operation of solid fuel purchase.

When it comes to management of business specificities, the system treated, in its contracts maintenance module, the various kinds of contractual structures, weather they are related to material, transportation or discharging services. The different specifics clauses of the business, related mainly to deadlines and values, were also mapped in the respective contracts. Additionally, the system brings the concept of contractual revision, which allows the maintenance of the independent structures for each contractual version, guaranteeing the comparison and the contents changes history.

The contractual clauses are used by the shipping management module that reflects such specificities in the calculus of the deadlines and of the shipping expense values.

The intern and extern communication, among other businesses areas and collaborators, were resolved through an automatic e-mail sending mechanism and through the display of functionalities on-line, such as the Shipping Board and the document management module.

Therefore, the communication happens earlier, granting more organization of the envolved parts. The availability of information also improves the autonomy, since all the necessary data is always available and updated.

The centralization of information and operations in an integrated system is another important factor brought by the system to attend a big gap of the business. The availability of information that is integrated and, more importantly, organized brought to the daily operation more agility and reliability. The fast decision making and the organization provided by functionalities such as the Shipping Board decreased the need to use other artifacts and contributed to the following of contractual deadlines, which used to be a frequent problem.

There was an effective increase of productivity and efficiency in the business operations, as well as a reduction of the errors, which has a great impact in the operation cost reduction in the involved areas.

Another additional and important aspect is the traceability of the operation execution in each process stage. The system not only identifies the responsibility for

this execution but also makes the functionalities available only for those people who are responsible for them, what makes the information managed by the system more trustworthy.

5 Conclusion

One of the many benefits of the Solid Fuel System is the automation and optimization of many laborious tasks, reducing the time spent with bureaucratic activities and enabling the user area to focus in the decision making and negotiating.

The system is operating at ArcelorMittal Tubarão since the middle of 2007. Some of the described functionalities are still in the implantation stage, depending of the resolution of infra-structure technical aspects.

Considering the evolution of the system, it is expected that dependences with other systems that only exist in ArcelorMittal Tubarão is replaced by a general integration with SAP. Doing this, the system would be unattached to an owned infra-structure, thus, being possible to implant it in other sites of the ArcelorMittal group, making it the official corporate solution used for hiring and accompanying of solid fuel shipping.

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