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TECHNOLOGY and BUSINESS Petroleum

The Brazilian TECHNOLOGY and BUSINESS Magazine of Petroleum, Gas, Petrochemical and Plastic Industries
Year 8 Number 21 2006 € www.tbpetroleum.com.br

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Exclusive interview

Nestor Cerveró, director of Petrobras International Area

Petrobras, an international company

Modernization of Offsite Area

in Petrobras refineries: from field instrumentation reliability to the design of a new management model

Recent changes in global downstream have reconfigured the role and importance of the oil movement and tank farm (offsite) sector in refineries. This article presents the reasons for this re-evaluation, giving details of the steps that Petrobras has been developing for the extensive and structured modernization of this sector.

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Transfer and Storage (hereafter termed TE) is the name of the sector within Petrobras' refineries which is responsible for the transfer, blend ing, preparation/specification (drainage, homogenization, sampling), measurement and storage of petroleum and its products (intermediate and final) of a refinery unit. In addition to these logistical activities, this sector could possibly be responsible for the treatment of effluents and the operation of blow-down and flare systems.

TE has also interfaces with practically all the internal areas of the refinery (Production, Marketing, Optimization, Safety, Health & Environment, Maintenance and Laboratory, among others) and with various external elements of petroleum's supply chain (Exploration and Production, Transpetro – a Brazilian pipeline enterprise, Clients, ANP - the oil and gas regulator - , environmental regulator, etc).

The importance of TE in refineries

From a historical point of view, TE in Petrobras refineries was always subordinated to the same manager as processing units and was seen essentially as an operational area. Consequently, plans to modernize TE competed for resources against other investments in processing and frequently lost out, due to the low rate of return perceived in this area.

In recent years, however, this vision of TE has been challenged by technological developments and studies that have demonstrated this area's importance. The recent phenomenon of globalization and the increase in competitiveness have spurred refineries to seek faster and more unequivocal ways of achieving quality specification.

Client focus and continuous improvement in service levels have become essential in order to ensure profitability and market share. This question is especially serious for a refinery, since commodity-type products cannot easily be differentiated by price or quality.

Accordingly, TE's position as a logistical activity presents an array of opportunities for improvements in cost, time and final quality in the production of oil derivatives. This sector has taken on an important role, therefore, in differentiating the performance of a refinery, especially in its direct relationship with distributors.

There have also been growing concerns in society to environmental protection and worker health and safety. That way, time and money

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has been spent in creating relevant certifications and regulatory institutions. Again, the importance of TE has been recognized, to minimize, or even eliminate historical problems such as contamination, leakage of products into the environment and employee sick leave.

Structuring and Promoting the Modernization of TE

In response to this growing recognition of TE's importance, five priority steps have been defined. These will guarantee that TE modernization in each of Petrobras' refineries takes place profitably, efficiently and in alignment with its strategy. The steps are as follows :

1. Recommendations to improve the reliability of field instrumentation;
2. Analysis of adherence of information systems to operational processes;
3. Creation and diffusion of a database of best practices;
4. Customization of an investments analysis methodology;
5. Development of a performance evaluation tool.

Each of these five steps will now be explained in detail.

Recommendations to improve the reliability of field instrumentation

To function well, it is necessary that a tank farm has precise control over diverse variables such as level, temperature, pressure, flow, density and viscosity. Accordingly, guaranteed reliability of basic instrumentation is essential to accommodate new technologies.

It does not make sense, for example, to install an automatic blending system if the electric actuator does not operate the valve when it is activated, or if the indicator of the tank level is inaccurate. Investments in modernization without reliable basic instruments will never result in the expected benefits, and could in fact cause serious damage to the refinery.

Among the control instruments used in a tank farm can be cited: sensors that measure level, pressure, temperature, flow, density and viscosity in the tank or in the line; product quality analyzers; transmitters of variables measured for PLCs and DCSs; electric actuators in valves, pumps and agitators that act upon the controlled variable based on the signals received from controllers and supervisors; etc.

In this context, the first step in promoting TE modernization is to compile a set of recommendations to help operators and technicians in: (1) selecting the instruments to be used, depending on the product, conditions of use (temperature, pressure, etc) and the level of precision necessary; (2) overseeing the installation of instruments, guaranteeing adherence to supplier demands; (3) correct usage of instruments to ensure their accuracy and longevity; (4) defining the regularity and type of maintenance to be conducted.

Analysis of adherence of information systems to operational processes

The second step in the TE modernization agenda deals with the analysis of existing information systems, and their suitability to support operational processes, according to current particularities in the brazilian refining network.

Firstly, it should be clear that within the scope of this article, a 'process' should be understood as a structured and measurable set of activities designed to achieve a global and client-oriented objective. Besides, TE processes should not be confused with physical and chemical processes relating to transformation of petroleum, such as distillation, cracking, coking, etc.

Secondly, a holistic and systematic view must be taken of day-to-day operations in a tank farm, in order to identify the following information for each activity in each process to be analyzed: trigger events in the beginning or end of the activity; in- and outflows of information; documents that are generated, consulted or merely accessed; executors and their level of responsibility in the activity; current information systems and their functionalities; demand for new functionalities or systems; major problems or considerations associated with the activity, etc.

Finally, this extensive information gathering should orient the creation of an illustrative model of the types of demand that TE establishes in relation to functionalities executed by information systems. It is also important that this representation is flexible enough to be validated by different refineries, and structured enough to display the relationships of dependency between functionalities.

Creation and diffusion of a database of best practices

This third step aims to create a single Reference Model to communicate existing and new best practices in operating tank farms in Petrobras refineries.

For the objectives of this reference model, the concept of best practice is linked to a better use of technologies such as information systems, equipments and field instruments that enable significant improvements in the performance of TE's processes.

Some examples of best practices are: utilization of blenders and on-line analyzers; automated systems of production scheduling; automatic activation of valves and mixers; and, samplers that isolate the product from contact with the operator.

It also envisaged that the TE Reference Model, repository of the best operational practices in this sector, will be flexible enough so that each Petrobras refinery will be able to conduct a gap analysis in relation to its current situation. That way, each TE manager should compare best practices, as described in the Reference Model, with the practices of his specific refinery, evaluating the applicability of proposed improvements in relation to its specific demands and particularities.

Finally, it is important for the company to incorporate, in its day-to-day operations, a set of routines to ensure the updating of the Reference Model, based on the continuous identification and record of emerging best practices.

Customization of an investments analysis methodology

The fourth proposed step concerns the development of a specific method (hereafter termed the EVTE method) for the financial justification of investments in TE. This method should be understood as a practical guide to the quantification of financial gains to be obtained from the implementation of the best practices presented in the Reference Model.

The financial quantification of an investment in TE should begin with the analysis of the increase in the reliability of the refinery. Gains of this kind result from the minimization of the occurrence of historic abnormalities arising from tanks farms. The gains should be obtained based on the cost of correcting them in the most economical possible way.

In theory, best practice acts on the causes of abnormalities, minimizing the probability of its occurrence. One should, therefore, compare the investment cost, the historic cost of the abnormality and the potential reduction in this historic cost enabled by the proposed investment.

Gains in reliability can produce cost savings in terms of: leakage, penalties paid to clients, lost sales, overstay, shut down in processing units, inefficient occupation of Transpetro pipelines, etc.

It should be noted that, although the abnormality may be caused in the TE area, the resultant financial losses should be quantified in the whole refinery and even outside it, taking into account the particularities of the logistical system of Petrobras' integrated operations.

A second kind of gain in TE arises from increased efficiency in the refinery's operations. Hence, there is a drive to optimize resources needed to carry out a determined productive process, maintaining the same level of output. Some examples of efficiency gains are the reduction in costs of labor, energy, giveaway and stock.

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A third and final type of gain concerns the possibilities of growth in the refinery's revenue (and not just reduction in expenses as in the two previous cases), based on increases in quantity sold and/or the margin obtained on each sale. Gains from revenue increases are strongly linked to the drive for investments that enables the production of new derivatives and the supply of new markets.

Still, it is important to observe that the presence of a best practice in the Reference Model does not guarantee its economic viability for all refineries. In fact, best practice enables better performance, but the gains generated do not always justify the investment made.

A second point to consider relates to the problem of a lack of a mature consensus to analyze gains and losses linked to the image of the refinery and, consequently, Petrobras as a whole. In this way, some investments could end up being undervalued due to the difficulty of quantifying this type of gain.

It is also worth observing that the proactive positioning of TE in defining its project portfolio based on a database of best practices and a customized EVTE Method does not imply isolation from the rest of the refinery. Information sharing with other sectors and the involvement of diverse multifunctional actors in this discussion is fundamental to increase its chances of success.

Finally, it is important to monitor the effectiveness of investments made, in order to validate and to publish the real returns for the whole company arising from the modernization of TE.

Development of a performance evaluation tool

A marked characteristic of TE, as others logistical sectors, is that the perception of its value is not explicit and direct as in the case of a processing unit that produces a new derivative to be sold in the market. The essence of TE is the movement of products by the refinery at the lowest cost (efficiency idea) and with a minimum amount of errors (reliability idea).

However, it should be made clear that the installation of blending systems alters somewhat this logistical characteristic of TE, due to significant modifications in product quality. In fact, some specialists even consider blending activities to be refinery units, since they blend intermediate products into final derivatives to be sold to the client.

In this context, the central difficulty in applying the EVTE method results from the lack of reliable information to quantify the record of financial losses in TE operations. Abnormalities which occur are in fact documented, but its record is focused on the safety of the installation, the employees and the nearby communities, rather than emphasizing the quantification of the financial loss.

The fifth and last step present in TE modernization agenda aims for the development of a tool (SISPE – Measurement Performance System) to monitor logistical and financial indicators that are representative of the reliability level at which TE is operating.

Its structure is based on the identification of the problem (for example, a contamination, a unit stoppage or a sales delay), the problem's cause (for example, the incorrect opening of a valve or a defect) and the quantification of the resulting loss (for example, a degradation or reprocessing of the product) for each abnormality that occurs.

To summarize, it is expected that the justification for investments in technologies proposed in the Reference Model will use the EVTE Method to achieve new reliability levels in TE operation, based on comparison with the information monitored in SISPE.

In addition, the continuous use of SISPE constitutes an important management tool, enabling a TE manager to evaluate quantitatively the performance of their sector against other similar refineries and against themselves over time.

From individual steps to a TE Management Model

The five proposed steps (recommendations to improve the reliability of field instrumentation; analysis of adherence of information systems to operational pro-

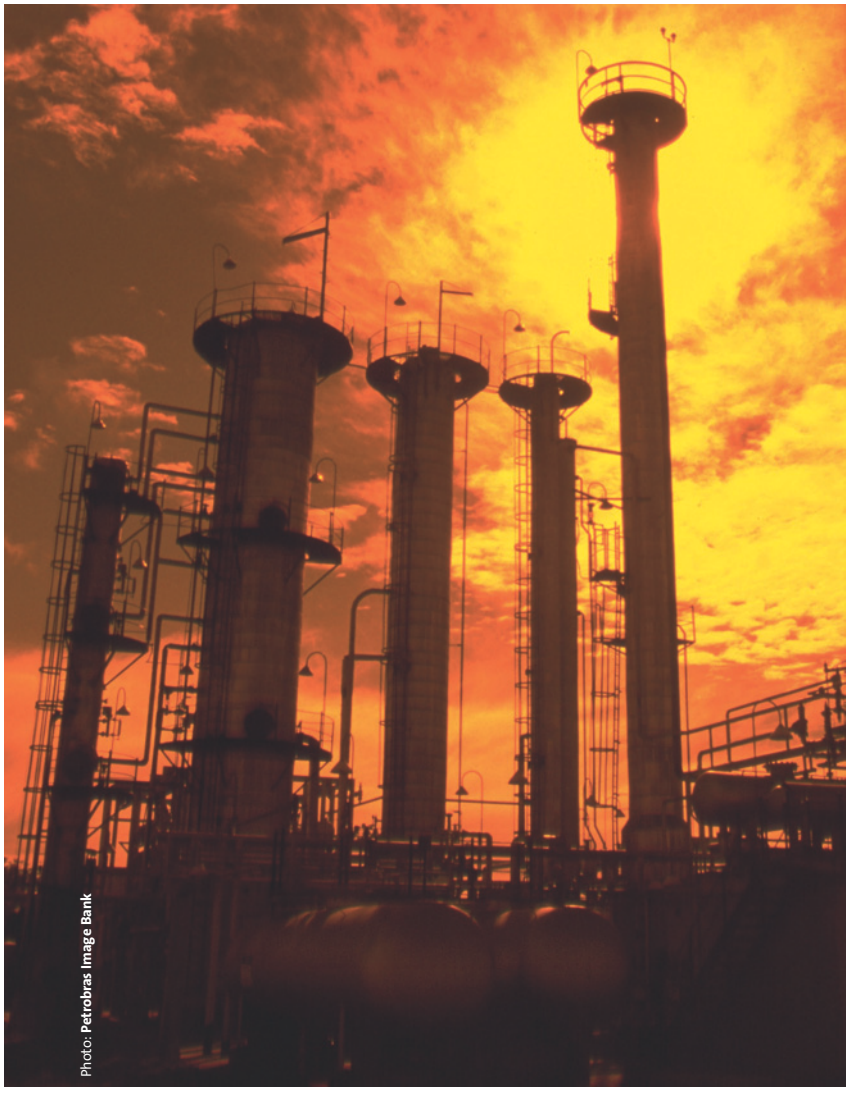

Photo: Petrobras Image Bank

cesses; creation and diffusion of a database of best practices; customization of an investments analysis methodology; development of a performance evaluation tool) should be understood as management solutions in response to issues taken as priorities and critical for the modernization of TE.

However, following the development of these initial solutions, it becomes necessary to identify, develop and structure the complete set of management practices affecting TE, to be added and integrated into a specific Management Model.

For the purposes of this article, the term "Management Model" should be understood as an idealized representation that describes how an organization's management should be performed. In pragmatic terms, a Management Model should be understood as a library endowed with management practices to be consulted and activated in organization's business process in order to improve its performance and effectiveness.

Below are listed the strategic objectives established for the TE management model:

(1) Description of how the management work of TE should be performed;
(2) Integration with the other five management solutions presented above;
(3) Identification and prioritization of TE management practices yet to be developed;
(4) Alignment of TE Management Model with the Reference Model of PNQ (similar to Malcolm Bridge Award)/AQG (Quality Management Evaluation area);
(5) Alignment of TE Management Model with Downstream Management Model.

Finally, it is necessary to apply the TE Management Model in each one of the Petrobras refineries in order to create specific and customized Management Manuals that should prescribe:
(1) The Management practices imported from the Management Model, with appropriate tailoring to ensure adherence to each refinery's specific characteristics;
(2) The size of the TE management team, taking into account the management practices to be executed and the expected workload;
(3) Activity flowcharts for each member of the TE management team, identifying the management practices that are being exercised in each instance.

Synthesis

Summarizing the ideas presented in this article, the following points should be highlighted:

- The search for reliability in basic instrumentation used in TE, to effectively support emerging technologies;
- The mapping of TE's demands for system functionalities that should support their processes;
- The development of a TE Reference Model to register and communicate its best practices;
- The identification of a portfolio of priority investments in TE of each Refinery, based on a gap analysis of the Reference Model;
- The application of the EVTE Method to the investment portfolio of TE, in order to analyze its economic viability within the company;
- The importance of SISPE in making tangible the value of operational reliability in TE, so as to justify its investments;
- The design of a TE Management Model that brings together management practices and illustrates how the management work should be done;
- The application of TE Management Model into TE Management Manuals for each refinery. ■