Adaptive Infrastructure Management Technologies of the Oil and Gas Company, SONARA, of the Republic of Cameroon

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Abstract: the purpose of my research is to put in place an adaptation technology to the Sonara company so that it can increase its production efficiency. SONARA is a processing type of enterprise for light type raw materials. However, heavy oil is currently being produced in Cameroon and there is a mismatch between the existing processing tool and the available crude oil. The enterprise is a semi-state company, most of whose shares are owned by the Republic of Cameroon, up to 80.29%: National Hydrocarbon Company, Stabilization Fund for Hydrocarbon Prices, National Investment Company and the Ministry of Finance. The state wants to increase the capacity of the refinery of finished petroleum products from 2.1 million to 3.5 million tons per year, and modernize all these infrastructures including its managerial system. The company aspires to live up to the expectations of the Cameroonian population and help the country which is advancing towards its emergence by 2035. The second phase of the modernization project, which has not yet begun, will consist primarily of the installation of a hydrocracking system to process heavy crude oil produced in Cameroon. The storage volume of SONARA is currently estimated at 132,500 m\textsuperscript{3}.

1. Introduction
SONARA is a processing type of enterprise for light type raw materials. However, heavy oil is currently being produced in Cameroon and there is a mismatch between the existing processing tool and the available crude oil. The enterprise is a semi-state company, most of whose shares are owned by the Republic of Cameroon, up to 80.29%: National Hydrocarbon Company, Stabilization Fund for Hydrocarbon Prices, National Investment Company and the Ministry of Finance. The state wants to increase the capacity of the refinery of finished petroleum products from 2.1 million to 3.5 million tons per year. The second phase of the modernization project, which has not yet begun, will consist primarily of the installation of a hydrocracking system to process heavy crude oil produced in Cameroon. The storage volume of SONARA is currently estimated at 132,500 m\textsuperscript{3}.

2. Specific objectives of Sonara
The project that SONARA is implementing today has three goals: strategic, economic and marketing. At the strategic level, it is about making the most of the crude oil produced in Cameroon. On an economic level, this project aims to achieve critical dimensions to increase the utilization rate of all processing plants. From a marketing point of view, it is about maximizing the products that are in demand in the Cameroon and regional markets, namely diesel and kerosene (jet fuel aircraft / lamps).
2.1. Analysis of the adaptive control of the SONARA oil refinery and modernization

2.1.1. Adaptive control and its classification. Adaptive control is a set of control theory methods that make it possible to synthesize control systems that have the ability to change the parameters of the controller or the structure of the controller, depending on changes in the parameters of the control object or external disturbances acting on the control object. Such control systems are called adaptive. By the nature of changes in the control device, adaptive systems are divided into two large groups:
- self-adjusting (only the values of the controller parameters are changed)
- self-organizing (the structure of the regulator itself changes).

Adaptive control by the example of SONARA company is used to control a nonlinear (dynamic) system, or a system with variable parameters. We analyzed the initial data of the oil production infrastructure earlier. The following tasks follow from this point: The presence of components that meet the conditions for the operation of the entire system of the oil industry. This section is divided into 2 parts: infrastructure that does not yet exist and needs to be built. The second part is an assessment of the state of the existing technology. In turn, the existing technology is divided into one that needs to be modernized for new working conditions and one that can continue to work as on (Figure 1: Adaptive management strategy).

![Adaptive management strategy](image)

Figure 1. Adaptive management strategy.

2.1.2. The principles of adaptive management against the background of the general management of the SONARA refinery. The management of the SONARA oil companies is a process, the stages of which are determined by the relevant regulations. The sequence of actions for each of the stages depends on the organizational structure of the company. Therefore, designing a monitoring and adaptive control system based on a set of standard regulations is ineffective for the following reasons:

a) Partial compliance of the regulations of different companies with each other. The system, developed on the basis of the normative documents of the SONARA company, cannot be introduced into the activities of another without significant changes.
b) Variability of the organizational structure of the SONARA company and the regulations of its work. In the case of optimization of work processes, changes in external conditions and corresponding changes in work regulations, the system will need to be modernized.

2.2. Features of adaptive management at Sonara

Adaptive enterprise management has a number of essential features.

Since changes in the external environment of the functioning of enterprises are of a large-scale, systemic nature, adaptation of individual enterprises to it involves the implementation of complex changes in the factors of the internal environment within their framework, which is essentially the restructuring of enterprises.

A modernization company SONARA must respond to a mathematical model (Figure 2: Adaptive management strategy).

3. Infrastructure management analysis

3.1. Project for the construction of a chemical fertilizer plant in Limbe and modernization of infrastructure

Management analysis in infrastructure facilities should respect the graphical model as shown by the function in (Figure 3: Adaptive management strategy).
Figure 3. An adaptive management strategy.

3.1.1. Sonara management development strategy. SONARA is governed by an 11-member board of directors. The Management Board appoints the CEO and is assisted by the Deputy CEO.
   A.) Operational and technical management.
      1) Operations management
      2) Maintenance department
      3) Department of technical control
      4) Management of quality, hygiene, environmental safety and inspection
   B). Administrative Offices.
      1) General direction Table 5 shows the structure and responsibilities of the company’s CEOs.
      2) Financial and accounting department
      3) Office of General Affairs
      4) Department of Public Relations, Communication and Translation
      5) Commercial Directorate
      6) Administrative and personnel management

3.1.2. Modernization of old infrastructure and Development and training of employees. To modernize old infrastructure, you need to start with building and purchasing or renting new equipment. It is also necessary to increase the capacity of atmospheric distillation and create a facility to maximize the production of gasoline. In addition, I believe the company needs a new vacuum distiller to achieve its goals. This will lead to the distillation of the distillate that will be used in a new hydrocracking unit that the company plans to build.
   I also understand that it is necessary to build new oil storage facilities and purchase new tankers for transportation.

4. Construction of new infrastructure
Infrastructure design is an important part of field development; it is necessary to draw up projects for oil and gas facilities and related services:
   • exploration work to study the subsoil in the specified region and predict the presence of minerals;
   • preparation of technological documentation for planning the field development process;
• design of the oil and gas complex, including oil depots, oil storages, warehouses for oil and oil products;
• development of control systems, automation and remote control for continuous monitoring of production processes;
• design of arrangement of oil and gas wells;
• preparation of measures to ensure fire safety and environmental protection with an assessment of the environmental impact of the facility;
• conducting engineering surveys and pre-design work aimed at analyzing and collecting technological indicators.

5. Conclusion
The expansion of the refinery will be accompanied by the construction of 10 bunkers that will be used to maintain excess production at the new refinery, as SONARA plans to increase its production capacity at the end of this first phase of work. This will increase the turnover from 2.1 million tons to 3.5 million tons, our source says.

The first phase of the modernization project of the National Oil Refinery Company of Cameroon SONARA, which aims to increase production capacity from 2,100,000 tons to 3,500,000 tons.

At the end of the first phase, the only refinery in Cameroon, in addition to improving its production capacity, will increase the daily capacity of the tanker trucks by installing an additional loading island.

Cameroon imports light crude oil from Nigeria and Equatorial Guinea and exports locally sourced crude oils that have the characteristics of heavy and acidic oils.

These heavy feedstocks cannot be optimally processed with the existing oil refining tool, which was originally designed to process light feedstock (Arabian light).

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