



••• **Business Impact**

Avoided **17**
facility shutdowns

Generated total
savings of
\$608,435 per year

CASE STUDY

Improving Operations through an Operational Excellence Model

Situation

At La Cira Infantas Field, the culture of training relied heavily on field and console operators. As a result, operators were not trained to a set of standards across the company, or across the facility.

To address this issue, GP Strategies® partnered with Ecopetrol to establish an Operational Excellence model complete with a training program and methodology that raised the level of professionalism and competence required for efficient operations and maintenance across the site.

- Implementing an **operational excellence model** lowered response times from **90 minutes to 30** and reduced weekly alarms from **22,000 to 4,500** in one year.

Program Description

The development of the rigorous Operational Excellence model started with the assessment of the individual competencies of each operator. Using the Operational Excellence model, the competencies and skills are improved through a structured training program with training guides, emergency response drills, what-if exercises, advanced troubleshooting programs, job aids, and more.

The application of these tools and programs has effectively closed operator competency gaps. The effectiveness of the training was validated by implementing operational drills to operators at multiple stations for re-establishment and continuity of operations, achieving response times of 30 minutes (reduced from 90 minutes). As a result, 17 shutdowns were avoided in 2015.

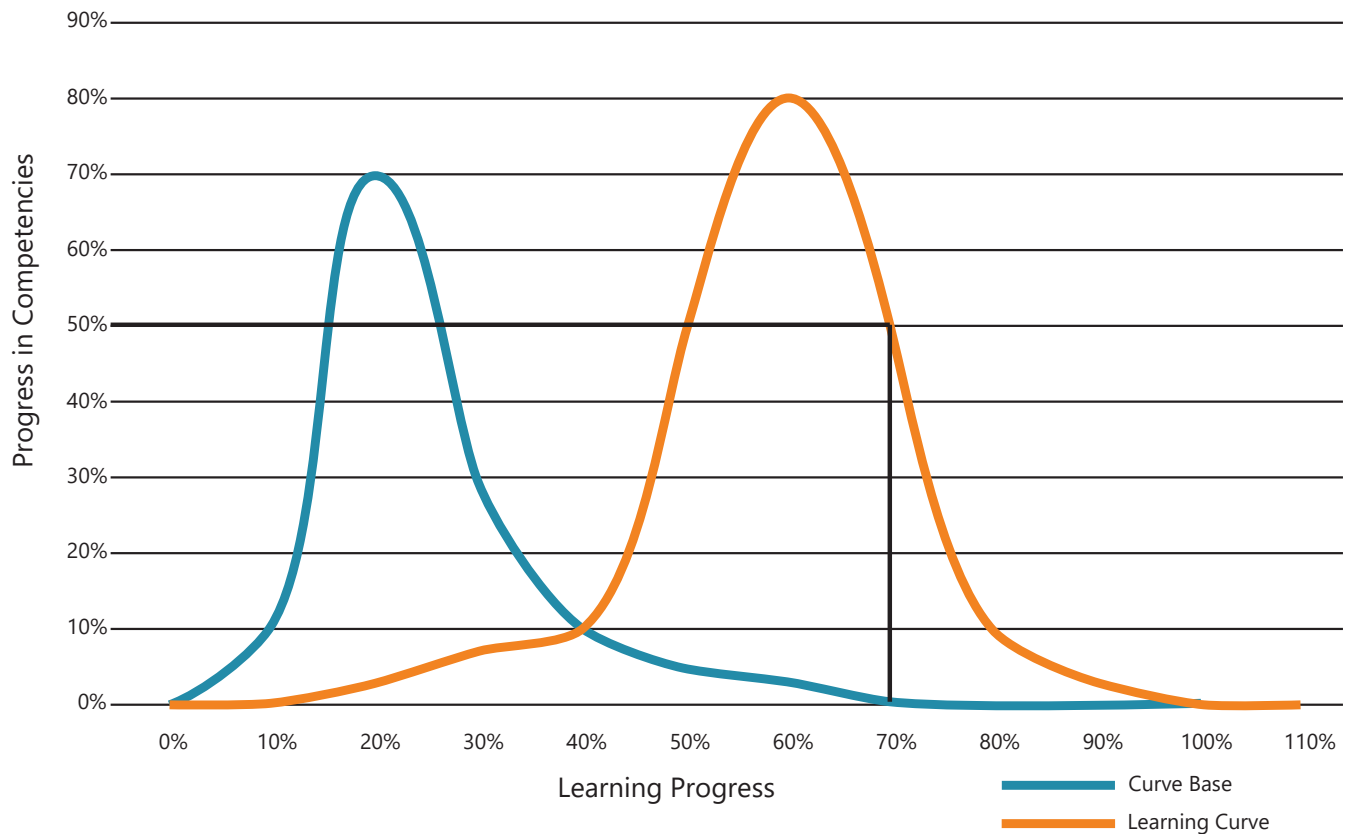
Additionally, with electronic equipment, alarm management has been reduced to close to the international standard values of 4,500 alarms per week. Through the leadership of La Cira Teca management, the rigorous implementation of the Operational Excellence program has directly and positively impacted 24 field station operators.

Results Obtained

Improving Technical Skills and Mobility in the Learning Curve

Figure 1 further demonstrates closing gaps by examining data from November 2015. During this period of time, an average learning curve baseline of 20% was established for operators. Learning progressed to 60% after implementing this process excellence model and its program elements. This has objectively ensured closing competency gaps and has achieved a standard for operators, enabling them to demonstrate mental models of the facility and work processes.

Figure 1: Operator Team Learning Curve



Progress in operator competencies improved from 70% to 80% and learning progress improved from 20% to 60%.

Process Improvement

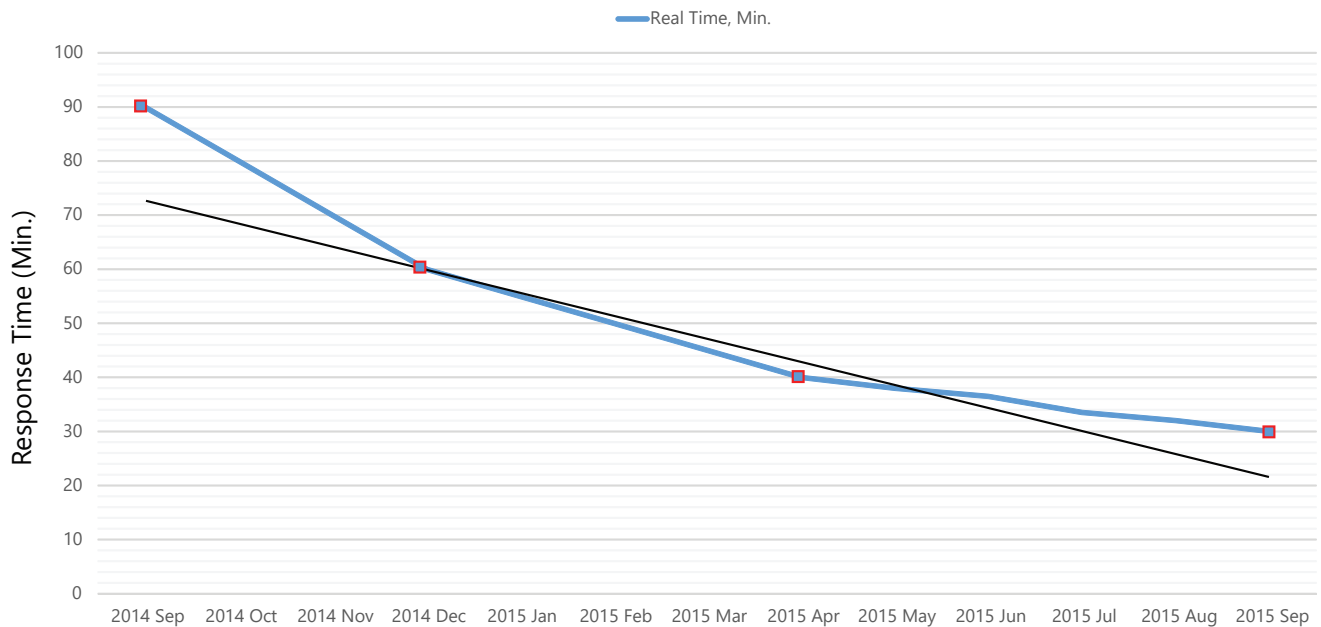
As a result of the Operational Excellence program, operator response was significantly improved, reducing the time to restore operation by 60 minutes. The program ensured an operational standard in the emergency response and systematic use of tools.

Table 1, Figure 2, and Table 2 demonstrate an opportunity to continue the improvement based on the use of dynamic process simulators to be developed in the next phase of the project.

Table 1: Emergency Response to Restore Normal Conditions

Year	Real Time (Minutes)	Comments
Sep. 14	90	<u>Base Line:</u> Actual conditions in a traditional non-defined process, word to word or peer to peer.
Dec. 14	60	Conceptual evaluation on issues for HSE, SER, transversal and specific, actual conditions in recovery. Developed a structured training process.
Apr. 14	40	Developed Operational Excellence tools and components, emphasis on training onsite, implementation of emergency drills.
Sep. 15	30	Implementation of emergency response matrix, procedures and drills, and application of What-If exercises.

Figure 2: Emergency Response to Restore Normal Conditions



In addition, this new program ensures production does not stop due to operator errors such as misinterpreting operational variables or processes.

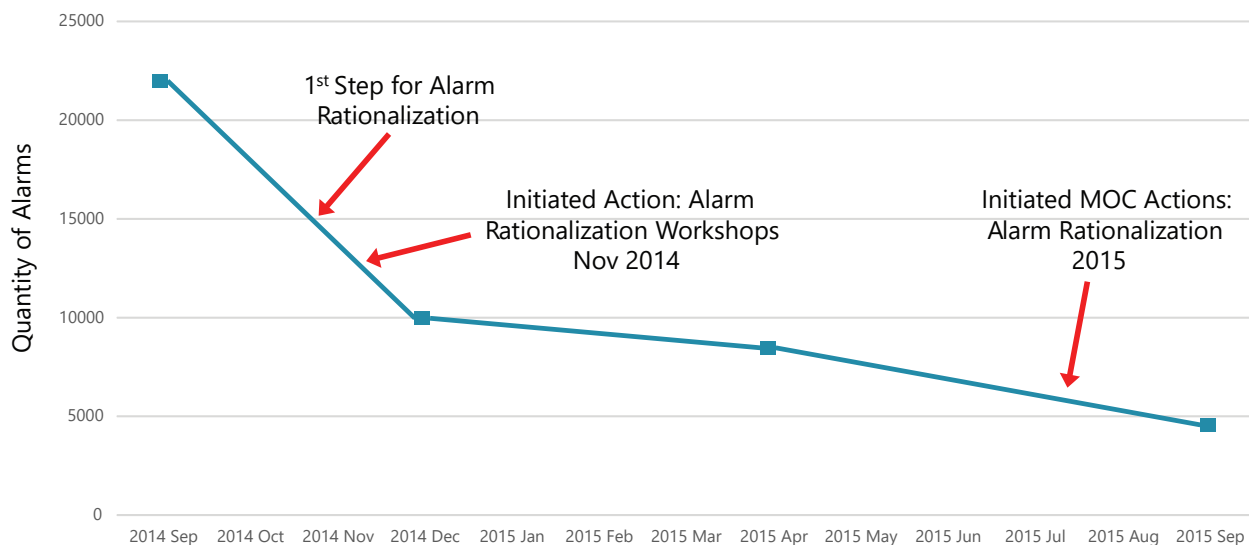
Table 2: Emergency Response to Restore Normal Conditions

Year	Number of Shutdowns Avoided	Comments
September 2014	24	Base Line: Operations were repetitively affected by electrical failures, operational problems in flotation cells, gum barrel tanks, skimming tanks, gas transferring processes, operational accidents, and high number of reprocessing equipment. Management estimated initial value for damaged equipment at over \$45 billion over a 5 year period.
December 2014	16	Evaluation and standardizing procedures for operational discipline. Standardize Ecopetrol for the development of structured operations, process safety assurance, and standardize the operating language.
April 2015	10	Development of Operational Excellence program elements, emphasize onsite training, implementation of emergency drills.
September 2015	7	Implement emergency response matrix, procedures and drills, systematic application of What- If exercises, leadership training.

Alarms Management – Process Safety

Process Safety is critical in the operation of a production field; it is designed to allow operators to focus on the parameters and operational variables under their responsibility and to appropriately control process loops and process improvement. Specifically, this helped achieve a significant decrease in alarms to the current level of 4,500 alarms per week. Although this is outside the international standard, the target is to implement the recommendations generated from the engineering team using the management of change (MOC) controls. See Figure 3 for an analysis of weekly alarms from January 2014 to July 2015.

Figure 3: Weekly Alarms



Business Impact

With the launch of this initiative, the following economic indicators were achieved:

- Contributed to improving productivity by decreasing the recovery time by 60 minutes to avoid 17 shutdowns in 2015.
- Generated total savings of \$608,435 per year.

It improved the competencies and skills of technicians using tools and methods developed through the program such as what-if exercises. As a result, technicians have adopted a mental model, allowing them to effectively understand and react to control systems for changes that may occur during operation.

Health, Safety, and Environmental (HSE) Indicators

As a result of this program, operational discipline, process improvement, and structured programs for process safety have contributed to the significant decrease in alarms.

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GP Strategies makes a special appreciation for the participation and commitment of the engineers, operators and technicians of the CIRA-TECA Collection Stations Raw, led by the Production Manager, Petroleum Engineer Norberto Díaz Rincón and the Advisory of the Vice President of Refining and industrial processes, chemical engineer and MBA Domingo Antonio Escalante Salazar. Translated from: Jorge Trespalcacios González, Norberto Díaz Rincón, Domingo Antonio Escalante Salazar, "Mejoramiento de las Competencias Técnicas a Traves de un Programa de Formación Integral de Operadores para el Campo la Cira Infantas de la Gerencia La Cira Teca" Negocios & Petróleo, Edición 13, (2016): 30-33.

Collaboration

The initiative included workers from all field stations from La Cira Teca, Ecopetrol University, and the Vice Presidency of Human Talent.

Steps for 2016-2020

The next steps are to:

- Implement and mature the development of the Operational Excellence program.
- Finalize the development and implementation of a dynamic simulator.
- Acquire the know-how for the sustainability of the process.
- Involve the Vice Presidency of Refining and Industrial Processes in the maintainability and assurance of dynamic simulators at the Cartagena Refinery.

About GP Strategies

GP Strategies is a leading workforce transformation partner—one of the few truly dedicated global providers in the marketplace providing custom solutions. We believe our transformation focus, when paired with deep listening, a customer-centric approach, and innovative expertise, enables our clients to routinely achieve superior business and operational results from our evidence-driven and technology agnostic recommendations.

Whether your business success requires a change in employee performance and mindsets, learning technologies, or critical processes, GP Strategies is the transformation partner you can trust.

GP Strategies World Headquarters
70 Corporate Center
11000 Broken Land Parkway, Suite 300
Columbia, MD 21044 USA



gpstrategies.com
1.888.843.4784
info@gpstrategies.com

