

Romanian refiner adopts electronic learning to raise efficiency

Following Romania's accession to the EU, a local refiner reassessed its approach to training to ensure a supply of skilled operators

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The Petromidia refinery was built in the mid-1970s and, for part of the time until its acquisition by Rompetrol in 2001, was run as a Romanian state-owned facility. Soon after its acquisition, Rompetrol started a large expansion and modernisation programme. This year, Petromidia celebrates 30 years of crude oil refining.

As Romania moved to an open market economy and the country joined the EU in January 2007, Rompetrol realised that investment in human capital would be necessary to keep the company dynamic, innovative and profitable. However, many hurdles needed to be overcome to achieve this. Money was in short supply and time was of the essence. Also, as a result of past legacy and culture, the refinery operators' work practices were too narrowly focused and the existing training was equally narrow and inward looking. Skilled operational trainers in Romania were almost non-existent and the majority of operators in the refinery did not speak English, so were unable to take advantage of training programmes available elsewhere.

Romp petrol retained HSB Solomon Associates (Solomon) for advice on improving the organisation's effectiveness; in particular, upgrading the operators' competence. Following a review of services offered by international providers, they together chose the learning methodology of Resource Development Company (RDC). After a successful pilot programme, providing 60 operators with 12 courses in four months, a formal operator certification programme was rolled out.

Background

With headquarters in Amsterdam, The Netherlands, the Rompetrol Group is a multinational oil company operating in 14 countries, with the majority of its assets and operations in France, Romania, Spain and South East Europe. Rompetrol is active in refining, marketing and trading, with additional operations in exploration and production, drilling, engineering, procurement, construction management (EPCM), and transportation. Its Petromidia refinery and chemicals complex is located near the city of Constanta on the shores of the Black Sea. Petromidia is a nominal 105000 b/d (14k T/d) medium-complexity refinery with reforming, catalytic cracking and coking capacity, and an attached petrochemicals complex.

Romp petrol has established itself as a competitive and vertically integrated enterprise. This evolution has brought with it several challenges, one of the foremost for the Petromidia refinery being the evaluation of the viability of the workforce, assessing their existing capabilities and retooling the facility's training infrastructure. The refinery needed to look for modern technology to maintain a competitive advantage in the region. In addition, Rompetrol wanted to shift the emphasis of its training from exclusively classroom-based to a more flexible learning environment.

Initial assessment

To help the Petromidia refinery establish a long-term strategy, Rompetrol consulted Solomon, which applied its performance improvement process, Net Cash Margin Measurement, Management, and Maximisation

(NCM³), to Petromidia's operational and reliability processes, including organisational effectiveness and training. This collaboration began by analysing existing internal training resources, of which there were few. During Petromidia's history as a nationalised refinery, there was little capital to invest in current technology addressing best practice. Over the years, efforts to find new training resources were inward-facing. This resulted in a static training programme that continually lost its vitality as experienced personnel retired and left the programme depleted of solid, fundamental, technical knowledge to be passed on to an incoming, less experienced workforce. Furthermore, because of each operator's narrow area of daily responsibilities, even the most experienced and tenured operators needed fundamental process training to be able to expand and maximise their productivity in other process unit areas within the facility.

After this initial assessment, some fundamental changes, to help Petromidia improve its human competency, were recommended to improve operating efficiency:

- Establish a training group at the refinery within the human resources department, with an overall mandate to improve the technical knowledge and expertise of staff at the site on all aspects of refining operations
- Collaborate with the corporate training group (at the head office in Bucharest) on training in professional skills and managerial development
- Staff the refinery training group with several training officers, preferably drawn from experienced operations staff

Typical competency matrix for an operator

Training needs	Competency
1. Safety and environmental responsibility	Safety policy & rules Personal protective equipment usage First aid administration Fire extinguisher use Water canon use Fire training Emergency procedures Rescue training Safety shower use MSDS (material safety data sheet) Environmental permits Safe entry procedures
2. Skill and knowledge in process parameters and unit care	Lubricant characteristics Procedures to grease motors & fans Sampling procedure Steam trap function Hose connection & use Gas testing (for permits) Work permit process Responding to pump seal leaks Pump surveillance (what to look for) Sight glass cleaning Zeroing a level gauge Valve types training Utility system training Insulation, tracing
3. Specific equipment operating training	Distillation fundamentals Pump operation, startup & shutdown Pump seals system Compressor operation Turbine operation Heat exchanger fundamentals Furnace operation Instrument fundamentals Electric supply & distribution Boiler fundamentals
4. Special topics	Fundamentals of process control DCS functionality Unit startup, shutdown Refinery economics Electrical hazards Lab computer system PI data system P&ID training

Table 1

● Initiate an operator training and certification programme geared towards safety, environmental compliance and profitability of refinery operations.

Challenges

Solomon and refinery managers determined that an external content provider would be needed for the operator training and certification programme. To be truly effective, a traditional North American or West European approach to training would need to be modified to overcome several challenges, such as:

● A large number of operators in the

refinery did not speak English and only felt comfortable in a Romanian learning environment. A fair number of staff had only a working knowledge of the English language. The technical terms for refining equipment, processes and applications were different in the two languages

● With Romania now part of the EU, Romanian operational instructors were difficult to find, as many were working in other countries

● Instructor-led classroom training in English (or another European language) would require a full-time translator during the course, which limited flexibility

● Due to limits on class size, a repetitive process with a foreign instructor and a translator would add to the cost of training because of travel and *per diem* expenses. Several dozen courses in this mode would be prohibitively expensive

● Non-Romanian training classes left only English texts for reference. Copyright issues made translation difficult and time-consuming

● Labour contracts and other logistical issues made it difficult to schedule a large number of operating staff, who work in shifts, in a classroom working to fixed time slots.

Blended learning

Solomon suggested Petromidia should create a blended learning environment based on the best new learning technology offered, where technically sound content would be the primary foundation. Instructor-led training could then be employed for more specialised hands-on learning. As part of Rompetrol's long-term training strategy, it was important to choose a provider that allowed for custom content, including refinery- and unit-specific best practice. For example, while teaching a course on fluid catalytic cracking (FCC), the operators would feel more at home when equipment diagrams specific to Petromidia were displayed rather than generic industry graphics. Petromidia's process and instrumentation diagrams, as well as operating procedures, should easily be attached to this course. In addition, the content needed to be offered in the Romanian language. Petromidia needed flexibility to decide the passing grade and method of record keeping for annual certification of operators. Within a guideline of calendar timing, distant learning would offer the learner the opportunity of flexible training hours and repeated visits to the same course for additional reference.

Besides quality content, the Petromidia refinery also needed a web-based delivery system that could effectively support the new blended learning approach, combining electronic learning courses with classroom instruction. A provider that

could offer both content and a learning management system (LMS) would be the preferred choice. The objective was to find an integrated technology that would ensure a better methodology for knowledge transfer and expeditiously improve competence. The result of these changes in Petromidia's training infrastructure would, in turn, lower the cost of operating the training programme.

Manageable curriculum

Rompertrol chose as its training provider Resource Development Company (RDC), developer of PILOT (Programmes in Learning Operating Techniques) in conjunction with the American Petroleum Institute (API). Rompertrol considered RDC's content to be superior in terms of its instructional design methodology and expertise in the subject. RDC had also introduced the training records information management (TRIM) system and was the first e-learning provider to be certified by the International Association for Continuing Education and Training (IACET).

Much of Petromidia's workforce would be unfamiliar with e-learning, so service and support structures were established early to ensure the concept was effectively orientated and implemented for the employees. Of the more than 250 ePILOT courses available, it was important to choose a manageable curriculum to start with. Typically, refineries start with a competence matrix required for each job level (see Table 1) and then map available courses to each of the required elements. The list is further expanded by inserting planned timing (depending on the training budget), which then becomes a five-year training target within the long-range plan. Rompertrol did not want to lose time in the move towards an operator certification programme. Ultimately, 12 fundamental technical skills courses were chosen as an initial curriculum. It was decided to begin with a small but representative group of operators, with the idea that larger groups would be incorporated over the next two years.



Figure 1 Introductory window to the e-learning programme

A pilot trial

RDC began by developing a Petromidia-branded learning site. The objective of a pilot trial was to identify any issues regarding course content, translation and web connectivity, and to resolve them before the bulk of the training was conducted over the next several years. The 12 ePILOT courses and information for 60 operators was uploaded to the system.

The next task was to translate the content into the Romanian language. RDC devised a methodology that allowed for a direct translation using a web-based environment and a selected group of Petromidia's process engineers. After RDC conducted a short virtual orientation training session for the engineers online

through a remote connection, a real-time translation was completed via the internet. In addition, text embedded in the graphics in each course was translated. RDC then reformatted the courses, where necessary, to ensure the proper orientation of text and graphics in each learning frame. The translation project for the 12 courses took approximately four weeks to complete.

This project enabled the Petromidia refinery to create a Romanian version of the technical content at a fraction of the cost and time that is typically required in the industry for custom-created content. A training room equipped with a number of computers with broadband connectivity was

Curs	Rev.Cursuri, Titlu	Expiratiile	Wrs	Pre-rcs	Desc	Learn	Eval	Exam
A1011a-RCM	1 Distilarea Practica: Comportamentul Hidrocarburilor	04/29/2009 0.0	-	-	-	-	-	-
A1011b-RCM	1 Distilare Practica: Principii si Practica	04/29/2009 0.0	-	-	-	-	-	-
A1012a-RCM	1 Distilarea Practica: Echipamente de fractiunare	04/29/2009 0.0	-	-	-	-	-	-
A1021-RCM	1 Operarea echipamentelor: Tehnologia	04/29/2009 0.0	-	-	-	-	-	-
A1023a-RCM	1 Compresoare Centrifugale: Introducere	04/29/2009 0.0	-	-	-	-	-	-
A1061-RCM	1 Instrumentatii: Masurarea Presiunii si Temperaturii	04/29/2009 0.0	-	-	-	-	-	-
A1062-RCM	1 Instrumentatii: Masurarea vitezei si debitului de lichid	04/29/2009 0.0	-	-	-	-	-	-
A1095-RCM	1 Crearea catalitica in alinai Rafinarii	04/29/2009 0.0	-	-	-	-	-	-
A1096-RCM	1 Rafinarea Catalitica	04/29/2009 0.0	-	-	-	-	-	-
A1128a-RCM	1 Tehnici de Control ale Accidentelor: Introducere	04/29/2009 0.0	-	-	-	-	-	-
A1128b-RCM	1 Tehnici de Control ale Accidentelor: Practici de Siguranta in Placaj	04/29/2009 0.0	-	-	-	-	-	-
A1131-RCM	1 Caracterizarea in Siguranta a Rezonanțelor: Pregătirea Pentru Corolare	04/29/2009 0.0	-	-	-	-	-	-

Figure 2 Annual operator certification status page

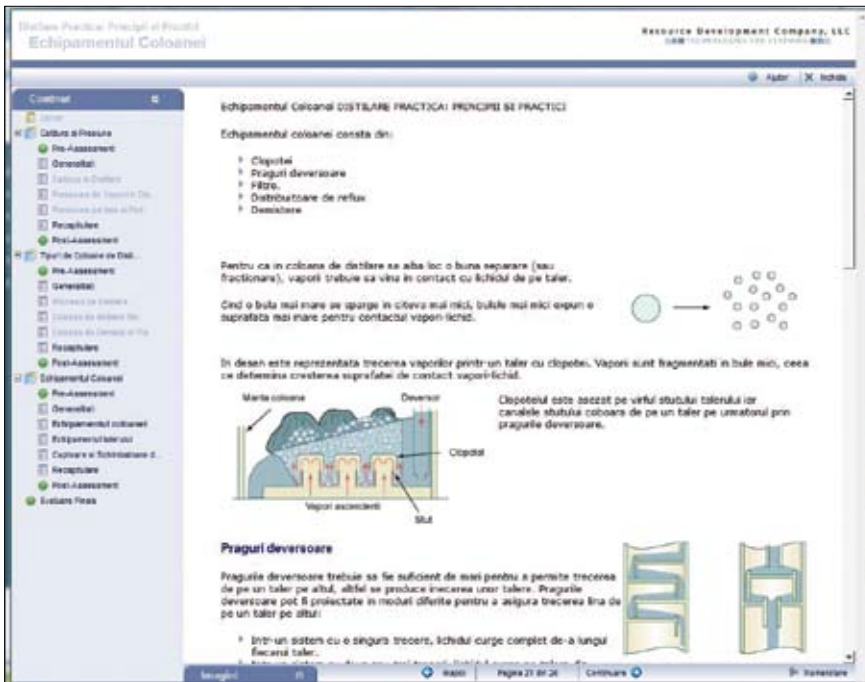


Figure 3 A typical page from the fundamentals of distillation course

available and helped Petromidia to start the programme immediately. Operator learning schedules were drawn from the established shift rotation plan.

To begin learning, the operator first connects to an introduction window within the Rompetrol intranet site (Figure 1). This explains to the operator the objective and rationale of the operator certification programme, passing grades required, a full slate of courses that the refinery offers and other pertinent information that Rompetrol decided to include on the opening frame. This page is common to all operators.

The operator then logs on to the e-learning web page with a personal username and password, and a specific window opens (Figure 2) for the operator's use; this is confidential to the operator and the training group. This window lists all of the courses assigned to the operator, for completion within the following year, to comply with the annual certification programme, out of the expected course curriculum for the full operator competency programme at the specific job level. The required curriculum may include a combination of e-learning courses, on-the-job training events and classroom courses. The

operator thus becomes accountable for understanding the requirements of the task and for managing learning time accordingly. This page also lists the status of each course, when the course is completed, the grade obtained and the date of award of certification.

The operator launches each training course in sequence. The course schedules are set so that all operators belonging to the same shift from one area of operations are training together and are all assigned the same amount of time to complete one course, as determined by the training officer. Any operators lagging behind or making unacceptable progress are encouraged to complete the course in their own time. Figure 3 shows a typical course page for the fundamentals of distillation course.

Each course presents the material in a logical and progressive order, and requires the operator to actively participate in the learning process by occasionally testing the trainee's knowledge. Upon completion of the learning module, the learner signs on to the certification module, in which knowledge gained is scrutinised through multiple Q&A sessions covering all sections of the course. The answers are automatically graded and, upon completion of the final evaluation, the score is revealed to the student, and the individual's training page (Figure 2) is updated. The ePILOT programme has a built-in records management system that tracks and provides the training manager with the progress of training (Figure 4) undergone by each employee, comparing their progress to the courses required.

The pilot stage was successfully completed within ten weeks and the 60 operators were certified to have passed the 12 courses, clearing the minimum passing grade established by the Petromidia training group.

Feedback from trainees

The operators who completed the initial set of 12 courses and the engineers who translated the courses were surveyed to evaluate the usefulness and efficiency of the pilot trial. The feedback was positive and

ID	NAME	EDUC	Department	Job	Qualificația de la 05/2012-2013
000199	IAN	NICA	Rompetrol	Operator	N
000206	PERIN	ESAH	Rompetrol	Operator	Y
000189	SARGH	SKAR	Rompetrol	Operator	N
000290	ANA	CELOSIANARU	Rompetrol	Operator	N
000126	COARFARIU	FRAN	Rompetrol	Operator	N
000438	CATERINA	VALE	Rompetrol	Operator	Y
000677	STIRINA	CARACRAIU	Rompetrol	Operator	Y
000492	SERBIL	CIOTRAZAR	Rompetrol	Operator	N
000720	SCAR	CIOTRAZAR	Rompetrol	Operator	N
000728	SCHISTEU	GALITA	Rompetrol	Operator	Y
000768	GHITOCIU	GHITOCIU	Rompetrol	Operator	Y
000883	SICAR	SILBES	Rompetrol	Operator	N
000463	REHAI	FIORIN	Rompetrol	Operator	N
000865	IMRIS	BRALVIC	Rompetrol	Operator	Y
000908	STEFAN	STREB	Rompetrol	Operator	Y
000860	SCARAN	SCARAN	Rompetrol	Operator	N
000883	IMBACIUC	TILBES	Rompetrol	Operator	Y
000169	MAIER	ILBES	Rompetrol	Operator	N
001244	COBLET	POPCES	Rompetrol	Operator	N
001220	TEODOR	MAIER	Rompetrol	Operator	Y
001652	SCITLAR	LEONIAN	Rompetrol	Operator	N
001654	MAIER	MAIER	Rompetrol	Operator	Y
001658	LEHAR	PETRU	Rompetrol	Operator	N
001666	CIOTRAZAR	CIOTRAZAR	Rompetrol	Operator	N

Figure 4 Refinery training records information management

these employees recommended expansion of this mode of training to all appropriate Rompetrol employees. Some comments were:

“The courses were useful. We need more courses like these to give us confidence to operate complex machinery.”

“The courses provide good fundamentals to operation and served as refreshers to items we learnt before but had forgotten. Additionally, we learnt new ideas.”

“The technique is an interesting way for professional development.”

Benefits and next steps

Petromidia is using the Romanian version of the training programme for another 300 employees over the next two years. In addition, Rompetrol has the ability to expand the training programme by offering the translated courses to several hundred additional staff at its petrochemicals complex, Vega Ploiesti refinery and other Rompetrol companies within Petromidia. Rompetrol will also use these courses as initial training material for new engineers and as refreshers for more seasoned technical staff.

Given the success of the pilot implementation phase, access has been expanded to an additional 120 operators and the next set of 12 ePILOT programmes has been identified for translation and inclusion in the system. The training group at Petromidia has started finalising the operator competence versus training needs matrix. To develop the project from ePILOT to iPILOT, additional enhancements are available:

- Differential learning is a technology that dynamically selects and delivers content to match each requirement, based on an initial assessment
- Competence assessments quickly assess current knowledge and pre-qualify top-tier candidates for consideration for employment
- Content customisation provides the ability to blend information specific to Petromidia’s operating paradigm, such as process terminology, equipment ID numbers, unit photographs and procedures, with existing content

- Implementing best practices allows for inclusion of best practice into Rompetrol’s training and its implementation across multiple operating units and sites

- Instructor guides and learner reference material provide the tools to use ePILOT content in instructor-led training; it incorporates hard copy instructor guides and learner reference material.

The Petromidia refinery faces an incoming workforce with diverse experience and educational backgrounds. In any training situation, no two students are alike, nor is the existing knowledge they bring to the enterprise. Training programmes that consist of predominantly classroom learning often prove to be largely

Implementing differential learning technology expedites individual learning and provides a tangible return on investment for shareholders

ineffective because there is no way to certify that trainees have actually learned and understood training objectives.

This personalised closed-loop methodology ensures full competence, shortens the time required for training and makes the most of instructor-led resources. This process is as valuable for experienced and tenured workers as it is for new hires. Significant cost savings can be achieved annually by applying this same approach to mandated refresher training. Having Petromidia’s tenured workforce assess and validate the knowledge they have retained prior to beginning refresher training will allow them to focus their valuable time learning only the material they need to revisit in order to remain competent and in compliance. Implementing differential

learning technology expedites individual learning and provides a tangible return on investment for shareholders. This approach addresses the issue of training a diverse incoming workforce and applies a consistent methodology that can be implemented across multiple sites.

In conclusion, leveraging the best of e-learning technology available today will help Rompetrol and the Petromidia refinery to maximise training resources, bring consistency to their curriculums, and adapt to and incorporate new best practices knowledge while lowering its total cost of operation. Experienced and tenured operators, and maintenance crafts and process engineers eventually retire, and frequently the experience and knowledge they have accumulated over a career exits the refinery gates with them. In spite of the current difficult economic times, Rompetrol has chosen to keep funds available in its training budget and continues its long-term investment in the development of staff skills and competency. Petromidia’s investment in e-learning will help overcome the issues related to workforce attrition and training resource limitations, ensuring Rompetrol remains in a leading position to become one of the most successful independent oil companies in Europe.

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