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rompetrol | KazMunayGas International Group Member

2022

Rompetrol Rafinare S.A.

INVESTMENT BUDGET 2022

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Important Note: *The Investment Budget for 2022 has been prepared without considering the consequences that may impact the Company's activity as a result of the war in Ukraine, the restrictions that may be imposed by the Community and / or Romanian authorities regarding import of crude oil from the Russian Federation, unpredictable increases in utility prices, etc.*

Depending on the evolution of the context, which at this moment appears to be impossible to anticipate and extremely volatile, the Company will re-evaluate the Investment Budget accordingly.

Investment program 2022

2022 Investment program is structured in 4 priorities projects, based on objectives and projects magnitude.
Total investments planned value for **2022** is **75,7 mil.USD**, following splitting per programs according below table:

	Budget 2022
Petromidia, from which:	**71,434,238**
Development	9,858,987
Operational Support	1,758,055
Compliance	11,677,416
Capital maintenance	48,139,781
Vega, from which:	**4,265,872**
Compliance	845,216
Capital maintenance	3,420,656
Refinery Total Investments	**75,700,110**

The main projects **which have planned impact on year 2022** in Rompetrol Rafinare SA:

- **2022 planned shutdown of Rompetrol Rafinare (Refinery and Petrochemical plants) and Vega Refinery, both own and operated by Rompetrol Rafinare SA**

For refinery, planned shutdown means a scheduled large-scale maintenance activity wherein an entire process unit is taken off stream for an extended period, including also field works for comprehensive revamp and renewal.
Rompetrol Rafinare SA Board of Directors adopted on May 15, 2018 a new strategy for planning the General Turnarounds and Shutdowns between 2018-2026 by reducing the actual cycle of 5

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years to 4 years for General Turnaround, respectively to establish a Shutdown between 2 General Turnarounds, every 2 years. This was helpful and seen in Key Business Drivers.
To reach refinery goal by having a high mechanical availability, refinery must have high reliability at low cost. This can be assured only by having periodically refinery turn around.
The main works packages consist of:

- Catalyst Replacement / Regeneration and Catalyst Services - all work related to the replacement of end-of-life catalysts with new or regenerated catalysts - to maintain a high gasoline / diesel production efficiency, and to obtain products with high economic value.
- Operational works - The other activities, which do not refer to maintenance repairs or modernization, but which are required in order to achieve good efficiency in the refinery, mandatory activities in order to prevent possible damage or defects of equipment due to corrosion, erosion, deposits in the technological process
- Maintenance – Usual repairs and inspection necessary for equipment static/dynamics and pipes that cannot be performed during units operation;
- Capital Maintenance – equipment's that will be replaced only in shutdown period.
- Capex or Improvement project – implementation of CAPEX projects that can be done only with plants shutdown.
- Unplanned /found works – works that appear after the equipment opening.

Within this project, the benefits are as follows:

- Maintain Refinery at its nominal monthly capacity.
- Maintain units safe and normal operating conditions until next planned shutdown.
- Improve efficiency of plant within high mechanical availability.
- Keep a high percentage of mechanical availability.
- Increase reliability / availability of equipment during operation.
- Safety–zero incidents

➢ **Replacement of strategic equipment**

Petromidia Refinery, is a very complex structure, with several industrial units managing different chemical processes, which involves a lot of static equipment's (such as columns, vessels, pipeline, valves, drains, flanges, etc.) and dynamic ones (e.g. compressors, pumps, etc.). The main purpose of these industrial facilities is to handle and to process crude oil and semi-fabricated products (hydrocarbons) in order to obtain finished products within quality requirements stipulated by national and international standards.
The following centrifugal compressors / pump represent strategical equipment for the Refinery Platform and an unexpected shutdown for any of it, conducts to related unit shutdown and significant production losses.

- 138FC1 – main air blower
- 138GC1 – wet gas compressor
- 130K1 – hydrogen gas compressor
- 220K1 – hydrogen gas compressor
- 180P77 – coke cutting pump

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In order to maintain mechanical availability of the Refinery Platform, spare parts of these strategic equipment shall be available anytime, (this is assuming long term manufacturing and specific expertise).
Currently below items were contracted and there are in an advanced phase of execution most of them being available for 2022 SD:

- 138FC1 compressor: new compressor rotor supplied – manufacturing finalized
- 138FC1 steam turbine: old spare rotor refurbished – refurbish finalized and delivered
- 138GC1 compressor: new case and internals supplied for 138GC1 manufacturing in progress
- 138GC1 compressor: old spare rotor inspected + inspection report – refurbish in progress
- 130K1 compressor: new compressor rotor supplied – manufacturing finished
- 130K1 steam turbine: new steam turbine rotor supplied + old parts – refurbish finished
- 220K1 compressor: spare rotor refurbished – manufacturing finished and delivered
- 220K1 steam turbine rotor: old spare rotor inspected and repaired – refurbish in progress
- 180P77 coke cutting pump: old, spare pump cartridge – refurbishing finished and delivered

Last item is scheduled to be finished beginning of 2023, 138GC1 new case and project closure is estimated on Feb 2024, connected with Turn Around and items storage location, manufacturer warehouse.

➢ **Replace Refinery static equipment**

It was started a program „Refinery static equipment rehabilitation" in order to create conditions for the operation of the Refinery at maximum capacity of crude oil processed by ensuring efficient cooling of gaseous fractions converted into gasoline, an improvement of the technological process, higher efficiency and an increase in quality and production.
This project aims increasing the mechanical availability of the refinery, in order to have a high level of equipment functioning in safety conditions and to maintain the refinery operating capacity at its nominal level.
Scope of this program is manufacturing, supplying, and installing below static equipment, with several items which shall be replaced in 2022 Shutdown:

- Static equipment's replacement Project (6 equipment's)
  - 100A1/1 and 100A1/2 tubular sections repairing (total replacement of pipes + distribution and return chambers repair as per NDT control findings). – manufactured and delivered
  - 120S4 purchase and installing of a new tubular bundle + new floating cap. – manufactured, delivered, and installed
  - 120S8 purchase and installing of a new tubular bundle. – manufactured, delivered, and installed
  - 190S13B purchase and installing of a new plate heat exchanger. (Dec 2021- delivered)
  - E401 PP Unit – purchase of a new tubular element. – manufactured and delivered
- Static equipment's replacement project (12 equipment's)
  - New tubular bundles purchased and installed for: 100S22C, 100S21B, 180S7B, E295/2. E212A. - – manufactured, delivered, and installing in progress

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- New tubular sections for air coolers: 122A1/1, 122A3/1, 122A3/2. – manufactured, delivered, and installed
- New distribution chambers for following heat exchangers: 313V-S2, ABS800. – manufactured, delivered, and installed
- New tubular bundle for 120S1E heat exchanger and new air preheater for 100H2. – manufactured, delivered and installed

- 130S5 180S5 121 A1 (3 equipment's)
  - New domed cover purchased and installed for 130S5 heat exchanger. – manufactured, delivered, and installed
  - New tubular bundle and floating cap for 180S5 heat exchanger. – manufacturing in progress
  - New tubular section for 121 air coolers. – manufactured and delivery in progress

  The estimated term for program finalizing is Aug 2022.

➢ **Firefighting Water Main Replacement**

The main goal of a fire-fighting system is to prevent, extinguish, localize, or block fires, trying to preserve live, protect property, limit environmental possible negative impact.
Main part of existing fire-fighting system represents water network:

- fire Fighting Pumping Station which is feed with water from Poarta Alba-Midia-Luminita Channel
- feeding line 1 - from Fire Fighting Pumping Station to the Refinery – 1,800m (DN1000)
- feeding line 2 - from Fire Fighting Pumping Station to the Refinery – 1,100m (DN1000)
- inside platform pipelines network, around 38,311m (with vary diameters between DN 100 and DN 1000) split in the Refinery, Petrochemicals, Crude Tank Farm (8x50.000mc) and Wastewater Treatment Plant areas.

TOTAL estimated 41,211m pipelines and related infrastructure for the firefighting system.

Water network is permanently rehabilitated with specific works like: replacing pipelines, hydrants and fire guns, new or repairing valve pits, undercrossing of existing infrastructure.
Rehabilitation program was started in 2010, having an initial duration till 2038, being in acceleration process with estimated finalization 2030. Annually is initiated a project, which contain work packages assuming und user priorities and available budget.

➢ **Swing HDPE to PP**

It is a strategic in progress project who has the goal to convert existing HDPE plant to produce both polypropylene and high-density polyethylene, giving more flexibility on propylene side avoiding remaining captive to Oltchim, buyer of extra propylene production from FCC.
Additionally, it will enhance the propylene value by producing PP, instead of selling it as it is by polymerization to polypropylene.

Following benefits of the project can be considered:

- Increase production capacity on the polypropylene range by converting the HDPE plant to PP, covering the entire production of propylene supplied by the FCC.

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- Add value to propylene by producing PP, which has a better market quotation.
- Split of PP production in two units conducts to more flexibility of production process, giving possibility to increase the quantities of special grades with add value.
- based on market requests, the unit will be able to also produce HDPE grades.

The project is under developing stage with following status:

- finalized tenders for critical LLIs (dryer and compressor), contract in approval and signing process
- obtaining building permit is in progress
- for 6 existing equipment authorization process is in progress
- tenders for rest of LLIs is in progress
- design review after completion of technical clarification of critical LLIs
- reassess project budget on the current market condition

Project BL finish is estimated for Jun 2023.

➢ **Refinery Catalyst Change**

2022 effort consists in:

- 122 DHT unit activation of catalyst supplying in 2021
- 130 RC unit sieving and make-up 20%
- 125 DHT unit delivery, replace and activation
- 120 V101 replacement opportunity analysis, supply and replace (just in case if needed)
- 352 HPP unit, contracting, supply, replace
- 147 MTBE unit, contracting, supply, replace

The benefits of program implementation are:

- Running refinery at nominal run rate.
- Operate all the units at planned capacity and obtain required quality of products

➢ **ISCIR re-authorisation for static equipment (ISCIR 2021-2022)**

Project consists in aligning to legislation requirements in terms of safety functionality of the refinery equipment.

In July 2010 occurred new modifications of the existing legislation, namely technical prescriptions C4, C6 and C10, 2010 edition introduced the obligation to prepare Examination, Checks and Investigation (EVI) Programs for all equipment and pressurized pipes older than 12÷18 years in order to perform Technical Checks in Use for Examinations with Technical Character (VTU-IECT).

For end user is mandatory to prepare Technical Documentation for each pipe and to re-authorize all pressurized pipes owned. By project implementation, the following benefits are expected:

- Running with the refinery units in safety conditions according to legislation in force, as a result of detailed verifications which will be performed during this evaluation program which will have as a result the technical evaluation of the equipment after specified years of service, as well as repair or elimination of the faults which will appear after the checks.

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- Obtaining the functioning authorization for the pressurized equipment, pipes and lifting equipment as per Technical Prescriptions

➢ **130 K1 PLC Upgrade**

130-K1 compressor is part of the Catalytic Reforming process reaction section. Its purpose is to compress hydrogen rich gas produced in Catalytic Reforming Unit and to assure both hydrogen needs in refinery hydrotreating units and the recycled hydrogen needed in RC reaction section, protecting the catalyst from coke deposits.
Steam Turbine driven compressor is controlled by MicroNet TMR (Triple Redundant Module). The system consists of a local PLC with operation from the installation and DCS visualization. The system was installed in 2005 and 5 years later it become obsolete (subcomponents are not manufactured anymore). Any problem that could appears at the PLC or at one of its cards makes it impossible to fix it due to the impossibility of purchasing PLC/Card and leads to unit shutdown, causing refinery slowdown.
Refinery doesn't have any spare part available in this moment and it was decided to supply a complete new system in order to maintaining the compressor 130K1 in operating capacity without the possibility of accidental shutdown due to the obsolete monitoring.
Expected benefits:

- Reliable antisurge control and protection, maximizing the compressor's operating region without recycle.
- Integration between antisurge and capacity control functions, helping to maintain precise flow control for the compressors within its operational constraints and to minimize effects of process upsets on the performance;
- Automated start up and shut down scenarios;
- Limited operator intervention;
- Single line of responsibility by guaranteeing the new system and ensuring the spare parts by the supplier for a period of 10 years after the acquisition;
- Reduced Capital and Operational Cost;
- Integration between the compressor control and communication to the DCS, simplifying the engineering effort. The system communicates with the plant DCS and allows operators to easily adjust operation of the unit via the DCS interface;
- Remote access and Comprehensive diagnostics and easy-to-use, intuitive, operator interface PC-based Engineering Workstation.

Project implementation is scheduled for 2022 SD.

➢ **Tanks rehabilitation program**

According to initial design, Petromidia refinery's processing capacity was of 3.5 mil. tons / year.
The main advantage of the refinery, according to the design, was related to storage capacity:
Existing tanks inside Petromidia Platform were used to store only intermediate products
Finished products were transferred through pipeline systems and stored in Oil Terminal.
In 2003, products transfer through pipeline to Oil Terminal stopped as a result of products losses of around 3%.

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For a period of time, the transfer to Oil Terminal was performed by using railway system. Considering high costs of railway transfer, in 2005 it was decided to stop the activity of products storage in Oil Terminal. Following this decision, the finished products started to be stored in refinery's tanks and the storage management was revised accordingly.
Starting with 2011 until 2022, existing refinery tanks were included into tank farm rehabilitation program. During this period 25 tanks were rehabilitated by implementing 21 related projects and for 24% of rehabilitated tanks, was increased the storage capacity with 20% per tank.
2022 Scope of work related to tank rehabilitation is the following:

- M92, 10,000mc diesel tank, capital rehabilitation and increasing capacity (construction works)
- V22, 400mc fresh solution tank, capital rehabilitation (construction works)
- T103, 3,150mc gasoline tank, capital rehabilitation (construction works)
- DH25, 5,000mc vacuum hydrofined distillate tank, rehabilitation (construction works)
- B6, 5,000mc gasoline tank, capital rehabilitation (design and start construction works)
- C101, 10,000mc diesel tank, rehabilitation (inspection, design and start construction works)
- C99, 10,000mc diesel tank, rehabilitation (inspection and design)
- M95, 10,000mc diesel tank, rehabilitation (inspection and start design)

➢ **Replacement of absorption column 185C1**

The absorption column, 185C1, from AMINE AND SULPHUR UNIT, manufactured by INDEPENDENTA Sibiu with manufacturing number 11685 from 1978, was got in evidence by IT ISCIR Constanta with the number CT 5326. The equipment was commissioned in 1980 and has no residual lifetime specified in the original project.
The column has the role to take out H2S from the refinery gasses rich in H2S. The gasses absorption process is conducted by absorption of the H2S in the amino solution.
In case the 185C1 absorption column malfunctions, the following problems may appear:

- The H2S level increases and is directed to the refinery gas oil network (135 V7).
- The H2S increased level in the gas oil, which is used for the refinery heater will lead to the increase of the SO2 emissions (thus polluting the environment).

During 2015 TA, there were performed the measurements of thickness with ultrasonic, they were detected values of thickness shell close to the limit resistance, there were made calculations for to determine lifetime, which was 2 years, until 2018 and after that moment prolonged till 2022.
Taking into account that a number of refinery unit have been upgraded (HPM, HPR, HDV, HB, MHC, RGF) to increase capacity, the 185C1 absorption column processing rate has now increased somewhat beyond the design flow rate of 17000Nm3 / h vs. 14841Nm3 / h. Under these conditions, a modernized column will be installed to meet the requirements under the new operating conditions, namely:

- The 185C1 absorption column is able to process a higher 20000Nm3 / h refinery gas flow rate as a result of increasing the capacity of the MHC unit and implementing the LPG recovery project and a minimum flow rate of 4000Nm3 / h.

Deadline for column installation is end of 2022 SD and expected benefits are:

- Eliminating the risk of stopping the technological line processing MEA and thus increase percent H2S of sweet gases, with repercussions in environmental pollution.

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- Increasing reliability and operational safety of the equipment 185C1.
- Decreasing maintenance expenses for column 185C1.

Project is scheduled to be implemented during 2022 SD.

➢ **Replace coke drilling-cutting system in the DCU unit**

The drilling/cutting system installed in the DCU unit works since the first start of the unit, in 1985. When the unit was upgraded, in order to increase the processing capacity, in the year 1993 by IPIP.SA - based on the Basic Process Design documentation elaborated by Sofresid-Heurtey, there was no upgrade done to the cutting/drilling system.

This system is worn out (this can be pointed out by the number of RI issued by Unit Inspection Department) and it presents a serious risk for the safety of the workers because the system is operated manually without any automatic assistance or monitoring. Also there is the problem of the spare parts, that are not produced anymore and the one existing on the market are difficult to procure and to adapt.

Cables are twisted on the cable drum, fact that can lead to splitting and tearing of the cables – leaving the drill stem in free fall on top of the coke drum.

The only braking system in service is a manual one - a lever that acts just on the cable drum. As a "back-up system" a pipe is used to hold in place the cable drum, that led to the damaging of the metallic structure.

The electric braking system has never been functional and if it is rehabilitated it only works on the cable drum and not on the drill stem.

There is no safety system to act on the drill stem in the case one of the cables breaks, or if the crown block breaks loose.

Most of the details submitted could lead to serious incidents that may affect the integrity of the reactors and of the entire plant, but also consequences with major impact and in the chain over the units of the platform. Therefore, it was proposed to consider during 2024 Shutdown replacing the system avoiding a major risk factor:

- Operating in safer conditions
- Reducing the risk of accidental stops due to the drilling system
- Operating the drilling system from a remote safe distance
- Reducing the cutting cycle by reducing the drilling/cutting time.
- A shorter time for emptying the coke reactors by 30 minutes.
- Maintenance predictability
- Reducing the energy consumption by reducing the working time of the high-pressure pump P77
- Remote monitoring the drilling/cutting system

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