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| **EXPLANATORY NOTE**   1. **General**   In 2021, Fluor S.A. conducted a performance evaluation study of the flare systems operated by AB ORLEN Lietuva. The study revealed that, under the worst-case emergency scenario (a complete power outage across the Refinery), the existing flares D-2 and D-4 at the Flare Section have insufficient capacity.  It was therefore decided to replace both flares with higher-capacity units.   1. **Description of Process Flow Diagram**   Currently, flare gas from LK-1 and LK-2, as well as other process units within the Refinery, flows through two equivalent 600 mm diameter headers (one in service and one in reserve) to the Flare Section. There, it enters separation tanks T-1, T-2 and T-3, T-4 (headers I and II, respectively), which are equipped with external water heaters. Gas condensate is separated from the flare gas in these tanks,. Flare gas with a temperature below 60 °C flows from tanks T-1, T-2 and/or T-3, T-4 to tanks T-9 and T-10, where condensate separation occurs. Flare gas with a temperature above 60 °C, along with excess unutilized gas and gas released by safety valves in the Flare Section, is routed via separate headers to flare D-2 for combustion. Tanks T-15 and T-16, equipped with external heaters, are installed upstream of the D-2 flare header to separate gas condensate. The flare gas is routed from T-15 and T-16 through two separate headers, passing through the hydraulic seal HU-6, to the flare D-2 for combustion. The flare D-2 is designed for open and safe burning of gas.  The 80-meter-high flare D-4 is designed for open, safe, and smokeless combustion of flare gas originating from KT-1/1. The current maximum flow rate of gas combusted in the flare is up to 76 tons per hour. Flare gas from emergency releases is conveyed via a KT-1/1 header, with a diameter of 800 mm, to the condensate separation tank T-21 in the Flare Section. Gas condensate is separated in this tank. Flare gas from T-21 is directed through the hydraulic seal HU-8 to flare D-4 for combustion.  Following the replacement of flares D-2 and D-4, flare gas will be routed through hydraulic seal HU-6 via an upgraded 1000 mm diameter pipeline to the flare D-2 for combustion. The new unit will be taller and designed with increased capacity to replace the existing flare D-2. Similarly, flare gas will be directed through hydraulic seal HU-8 via the existing 1000 mm pipeline to the new flare D-4. The upgraded D-4 flare will be designed in accordance with the FLUOR study specifications, with a combustion capacity of up to 635 tonnes per hour (t/h). Both flares, D-2 and D-4, will be designed to ensure that, in the event of an emergency, each can serve as a backup for the other.   1. **Description of separate design disciplines**    1. **Process discipline**   Process discipline encompasses the design of flare systems D-2 and D-4, based on OLPP225 design proposals and associated diagrams. Key deliverables include a process description, P&ID drawings, calculations (including thermal radiation assessments for flares D-2 and D-4), datasheets for relevant instruments, equipment and flares D-2 and D-4. Where relevant, datasheets for heat-tracing equipment must be prepared.  As part of the process discipline, an automation task must be created for detailed instrument design. Updates to existing potentially explosive atmospheres and the preparation of plans of new hazardous areas must be carried out, along with the necessary dispersion calculations for explosive materials. It is assumed that petroleum gas entering the flare system is classified as IIC T3.  The existing explosive atmosphere is classified as 1 IIC T3. | | | | | | | | | | | | | |
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| Rev. | Date | | Description (reason) of change | | | | | | | | | | |
|  | | | | | OLPP225 | | 930-00, Replacement of OS-3 Flares D-2, D-4 | | | | | | |
| Position | | Surname | | | Signature, date | | Explanatory note of design proposals  For process discipline | | | | | | |
| Operations Support Manager | | A. Vasiliauskas | | Agreed with | ARVYDAS | Digitally signed by ARVYDAS |
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| Process Engineer | | E. Blauzdys | | Prepared by: | EDGARAS | Digitally signed by EDGARAS |
| BLAUZDYS | Date: 2025.10.08 10:14:51 +03'00' |
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| As part of the process discipline, a HAZOP risk assessment shall be conducted prior to detailed piping and equipment design, simultaneously covering both flares.  **3.2. Process control and automation**   * According to P&ID FU-26-D2:   The number of instruments for the D-2 flare will be determined after the proposal is received.  A visual smokeless control system shall be designed, incorporating a ground-mounted sensor that monitors the main flare flame and, upon detecting smoke, automatically actuates and modulates the steam supply valve.  The maximum steam flow for smokeless combustion that OL can supply through the existing pipeline, up to the branch leading to flares D-2 and D-4, is 10 t/h. Refer to Attachment 2.  During the detailed design stage, it will be assessed whether the steam supply system for smokeless combustion requires modifications, including redesign of the existing flow meters, valves, and the piping from the header to the flare to accommodate a larger nominal diameter (DN).   * According to P&ID FU-28-D4:   The number of instruments for the D-4 flare will be determined after the proposal is received.  A visual smokeless control system shall be designed, incorporating a ground-mounted sensor that monitors the main flare flame and, upon detecting smoke, automatically actuates and modulates the steam supply valve.  The maximum steam flow for smokeless combustion that OL can supply through the existing pipeline, up to the branch leading to flares D-2 and D-4, is 10 t/h. Refer to Attachment 2.  During the detailed design stage, it will be assessed whether the steam supply system for smokeless combustion requires modifications, including redesign of the existing flow meters, valves, and the piping from the header to the flare to accommodate a larger nominal diameter (DN).    An HMI for monitoring the required heat tracing systems must be designed and incorporated into the DCS screens in the Flare Section Control Room. During design execution, once the final number of new instrument positions has been confirmed, the corresponding tag numbers shall be obtained from the Owner. All datasheets, design documents, and other deliverables for the new instruments shall be prepared using the tag numbers provided by the Owner.  **3.3. Process piping**  The required piping shall be designed in accordance with P&IDs FU-19, FU-26, and FU-28. Piping indicated in P&IDs FU-19 and FU-26 shall be dismantled. This discipline shall be developed in sufficient detail to enable the procurement and installation of the required equipment and piping components. Process flow diagrams show the required tie-ins to existing piping and valve installation points.  The detailed design phase shall include verification of whether the existing piping between the header and flares D-1 and D-4 (steam supply for smokeless combustion) and the associated measuring and control instruments require replacement.  Earthing and potential equalization connection points shall be designed for all newly designed or modified pipelines and their sections.  **3.4. Mechanical discipline**   * A new flare of greater capacity and height, complete with the required fittings and access platform supports, shall be designed to replace the existing flare D-2. (Refer to P&ID FU-26-D2). * A new flare of greater capacity and height, complete with the required fittings and access platform supports, shall be designed to replace the existing flare D-4. (Refer to P&ID FU-28-D4).   The outlet nozzle diameter of the flare gas stream at hydraulic seal HU-6 shall be increased (see P&ID FU-19).  For the procurement of new flares, preliminary data sheets for flares D-2 and D-4 have been prepared by the Owner as initial input. The Designer shall prepare the final data sheets for both flare procurement and detailed design. All technical proposals shall be reviewed and approved by the Owner.  Upon selection of the flare supplier, the Contractor shall obtain flare flame radiation calculations, including  the diameter of the sterile (safety) zone. Based on these calculations, the Contractor, in coordination with the Owner, shall finalize the installation locations of the new flares.  The Owner’s initial proposal is to install the new flares as close as possible to the existing ones; however, this may be revised following final flare selection.  Prior to commissioning of the new flares D-2 and D-4, the existing flares and all redundant accessories shall be dismantled. Unnecessary foundations shall be demolished to the extent required to allow their surfaces to be covered with surrounding soil or paving.   * 1. **Electrical discipline**   New earthing and potential equalization points, as defined by other disciplines, shall be connected to the existing earthing loop; if no loop is present, a new one shall be designed.  Lighting shall be designed for the work areas of the new flares D-2 and D-4, covering all associated equipment, including ignition panels, access routes, and control valves.  These design solutions cover reconstruction of existing work areas, not the installation of new ones. For the ignition systems of the replacement flares D-2 and D-4, an additional electrical power supply shall be provided from an uninterruptible power source (UPS).  Electric heat tracing shall be designed as required, with operating status indications integrated into the DCS screen in the Flare Section Control Room.   * 1. **Civil discipline**   Support structures for new pipelines and cable routes, as well as equipment access platforms, stairs, and walkways, shall be designed in accordance with the design solutions provided by other engineering disciplines.  The design shall include connections of new and modified structures to the earthing loop and potential equalization points.   * 1. **ATEX**   The existing design proposals may impact the current Ex zones; therefore, Ex zoning must be reviewed and updated where necessary.   * 1. **Environmental protection**   Calculations shall be conducted for flares D-2 and D-4 to assess changes in pollutant dispersion zones. | | | | | | | | |
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