

Use of HDPE Conduit Leads to Budget Saving

▲ By Saleh H. Ghusnah & Majed M. Ammar

In line with Aramco's efforts to optimize capital expenditures and maximize technology deployment, the Marjan Onshore Oil Facilities (MOOF) Project, which is under the Marjan and Zuluf Capital Program, considered the implementation of high-density polyethylene (HDPE) conduit installation over concrete encased polyvinyl chloride (PVC) conduit in its design stage to be installed in heavy hauling roads and road crossing areas, which led to significant budget savings.

Following are distinguishing features of both materials: (1) Both are strong and durable, but they have different applications; (2) PVC is heavier and stronger, while HDPE is harder and more resistant to abrasion and heat; (3) PVC is more suitable for direct burial and trenchless installations, while HDPE is more suitable for lower pressure installations that involve tight bending radius situations; (4) PVC pipes are stiff enough to permit their direct connection to mechanical valves and non-plastic fittings, while HDPE pipes are softer and require stiffening rings or other adapters to make proper connections; and, (4) another consideration is that HDPE has a lower carbon footprint as it has lesser weight and, therefore, consumes less fuel when transported.

The HDPE conduit is a multiple channel cable duct with an inner plain surface and specialized inner-coated pipe with a corrugated outer service that allows the whole channel to work as an integrated single body. For the MOOF Project, HDPE conduit is the preferred material to house and protect copper and fiber optic cables for electrical, telecommunication, and instrumentation, instead of the conventional concrete encased PVC conduit for underground cable installation in heavy hauling areas and road crossing due to its material's softness and flexibility, which can handle more surface pressure without breakage than PVC conduit pipes.

By introducing this new material selection in the project design stage, the project team managed to optimize and finalize the design of the cable conduit system for the aforementioned disciplines within the plant to replace the conventional method of installing concrete encased PVC conduit. The need of the concrete encasing is to provide more mechanical protection to the PVC conduit against the surface pressure resulting from the heavy vehicle movement such as cranes and heavy hauling trucks. The fact that the PVC conduits are hard and stiff, would make them more vulnerable and fragile when they

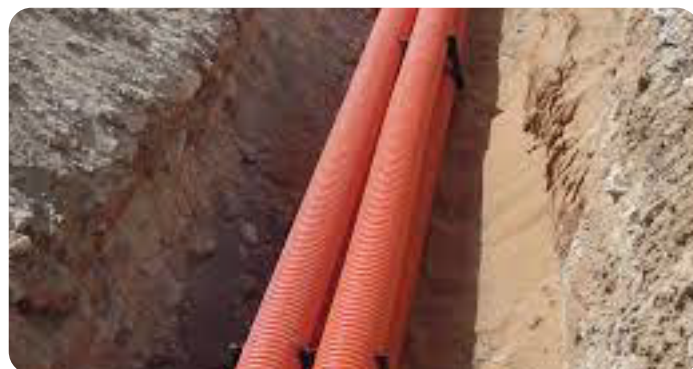
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are directly buried in road crossing and asphalt-paved area. This optimization resulted in a cost savings of hundreds of thousands of dollars by eliminating a total of 2522 m³ of concrete pouring. To have poured that amount of concrete, it would have required around 500 mixer trucks to cover an area of approximately five (5) kilometers.

The use of HDPE conduit has many advantages. One of these is its ability to withstand the extremely aggressive soil conditions at MOOF for a minimum of 50 years. HDPE conduit also requires less resources in terms of handling and installation. Moreover, it is easier to install than the rigid PVC conduit due to its lighter weight and flexibility for bending without breakage. In addition, a reel of HDPE conduit provides up to 1000 meters of continuous material, which affords continuous installation run and minimizes the number of joints and fittings. This property shortens the installation time and process. PVC conduit is available in the market up to 6-meter length pieces, which require more joints and fittings for installation. In addition to the previous benefits, HDPE offers a great deal of flexibility and easiness for maintenance to plant operation over the complexity of concrete encased applications. Also, the job hazards are more mitigated and controlled in HDPE installation when it comes to dealing with trenching and laying safety requirements.

The following photos illustrate the differences between the concrete encased PVC conduit and the HDPE conduit in terms of installation requirements and process:



Alternative method of using HDPE Conduit versus conventional method of concrete encased PVC conduit

For the Marjan Onshore Oil Facilities Project, the success of its cost saving through the deployment of HDPE conduit was also attributed to the collaborative efforts between Project Management, Consulting Services Department, Marjan & Zuluf Development, and contractors.

Badr M. Burshaid, manager of Marjan & Zuluf Increment Projects Department, said that this collaboration among Aramco organizations has been the key to reaching more cost-effective solutions and opening more doors to wider application in future projects.