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The Design Optimization for Construction Materials and Corrosion Control for Pressure Containments

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The design of pressure containment has been with optimization while maintaining integrity, for pressure vessels, pipings and pipelines. With field experience for more than 25 years, this was performed through corrosion rate simulation and inspection result evaluation.

After getting project design and engineering requirements, it was found that design envelopes were comparable to operating envelopes. Therefore, the design optimization strategy was set to utilize as much as possible the information of actual corrosion rates and inspection results got from field operation for each equipment, and collaborate with simulation results.

Corrosion rates were retrieved from thickness database of the most corrosive, representative equipment and platforms. These corrosion rates were compared to simulated corrosion rate results (taking corrosion inhibitor efficiency into account).

The decision was made amongst expertise in inspection, corrosion and metallurgist. The selection of materials of construction was finally made, along with mitigation e.g. corrosion inhibitor injection location and amount.

For examples, corrosion allowance of Carbon Steel equipment could be reduced based on the information from Pipeline Integrity Management (PIM) and the knowledge of Volatile Corrosion Inhibitor (VCI) efficiency; also, external coating was selected to be cost-optimized type based on subsea visual inspection results. The amount of cost saving has been considered significant.

For the bigger picture, information from corrosion and inspection will be further used in Machine Learning. For example, for more optimization in design and operation, Top of Line Corrosion (TOLC) prediction based on Machine Learning is expected to further reduce corrosion allowance and corrosion inhibitor injection.