Probabilistic Based Optimal Inspection and Replacement Planning of a Refinery Plant

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Refinery processes are in operation for several years without a shutdown. Pipes and equipment in a refinery plant are inspected and replaced during a shutdown. To maximize the profit of the plant, it is important to determine operating cycle because there is a tradeoff relationship between safety and economy. The more frequently shutdown and inspection, the safer the plant but the higher maintenance costs. Therefore, it is essential to develop an inspection and replace planning model for the refinery plant.
Since thicknesses of pipes and equipment becomes thinner and thinner by corrosion reactions, corrosion is one of major factors that threatens the safety of the plant. Due to that reason, this study focused on optimizing inspection and replacement planning of a refinery plant considering corrosion cost. Total cost to be minimized consists of initial design cost, inspection cost, replacement cost, and failure cost. All the costs except initial design cost were related to corrosion reactions by probabilistic functions of remained pipe wall thickness. The model developed in this study was illustrated by some case studies.