ABSTRACT

Corrosion Under Insulation (CUI) was found adjacent to the T-Type vacuum stiffening rings of the Deisobutanizer (DIB) tower. A Level 2 API579 local metal loss assessment failed to satisfy the fitness-for-service criteria. Therefore, a Level 3 assessment involving 3D finite element modeling was required to determine whether the Deisobutanizer tower with the localised corrosion damage was fit-for-service until the next scheduled shutdown. A 3D finite element model of the DIB tower including the local thin area (LTA) was created to determine the realistic stress distribution at the LTA considering, vacuum, design condition as well as operating condition. A series of different LTA models reflecting progressive corrosion damages were developed by taking into account not only the current damage level, but also a maximum possible corrosion rate as predicted by statistical method employing extreme value calculation. The stress/strain distributions at the LTAs for current and future conditions were analysed and compared with the global and local plastic collapse criteria available from the API579 standard. The Level 3 fitness-for-service assessment demonstrated the DIB tower with the local metal loss damage from CUI was fit-for-service, enabling the plant to continue to operate for the next two years until the scheduled turnaround.

KEY WORDS: Corrosion Under Insulation; Local metal loss; Finite Element, Fitness-For-Service; Remnant life.

INTRODUCTION

Corrosion Under Insulation (CUI) was found adjacent to the T-Type vacuum stiffening rings of a Deisobutanizer (DIB) tower. The localized corrosion spans around the entire circumference of the stiffening ring. The corrosion damage appeared the most severe at the 4th stiffening ring (Figure 1). An initial Level 2 Fitness-For-Service (FFS) assessment was carried out by the maintenance engineer, but did not satisfy the requirements of the Level 2 FFS assessment. Therefore, a Level 3 assessment in accordance with the guidelines of API579/ASME FFS-1 (API, 2007) was required to determine whether the DIB tower is fit for service until the next scheduled shutdown.