ABSTRACT

Broad side ship collision with jacket legs are investigated with special emphasis on the analysis procedure recommended NORSOK N-004 Appendix A. A jacket leg and the shipsode of a typical supply vessel are modeled, and impact simulations are carried out with LS-DYNA software. The resistance to denting of the jacket leg and the resistance to indentation of the shipsode are compared with the NORSOK recommendations. The distribution of energy dissipation and damage to the ship and the leg is studied for various leg thicknesses and two contact positions.

INTRODUCTION

Supply vessels, passing merchant vessels and shuttle tankers are regarded as the major threat for oil and gas installation. The accident statistics from the report (OTO 1999 052) shows that the majority (66%) of ship collisions with installations involve supply vessels. The collision event is of particular concern due to the potential of major consequential loss. This is illustrated by the Mumbai High North platform accident in 2005, where a collision with a stand by support vessel and the production platform, caused a devastating fire and total loss of the production platform in addition to 11 fatalities and 11 others missing. By this India lost significant part of her oil production for some period.

In the North Sea there have been two noticeable collision events. In 2004 the supply vessel “Far Symphony” ran into the drilling platform “West Venture” (Pettersen and Soegaard, 2005). Figure 1 shows that the forecastle deck of the supply vessel was completely crushed for a distance of 3 m, while the leg of the platform suffered minor damage. The energy dissipation is estimated to be in the range of 40 MJ. Pettersen and Soegaard showed that the energy dissipation calculated using the N-004 (2004) design curve for supply vessel bow gave almost identical damage as the one experienced. This confirmed that the design curve for bow superstructure crushing developed more than 40 years ago (DnV 1981) is reasonable.

Figure 1West Venture – Far Symphony collision.

In 2009 the well workover vessel Big Orange XVIII collided with the Ekofisk 2/4 –W tripod jacket with a kinetic energy in the range of 70 MJ causing severe damage to the three legged jacket and the bow (Kvitrud, 2011). Several braces of the jackets ruptured, and the jacket had to be dismantled, refer