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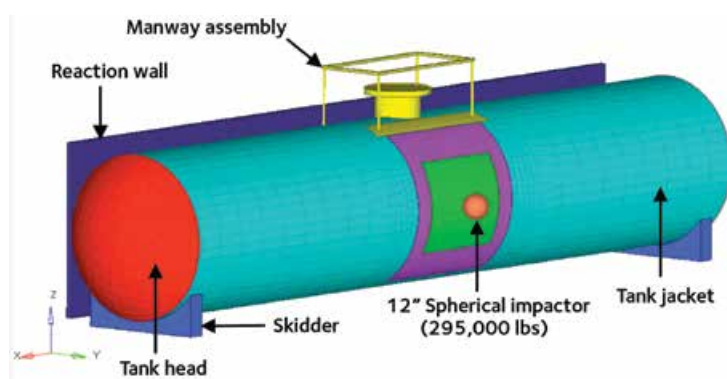
Tank Car Puncture Analysis

- Tank cars are commonly used in railroad industries for transporting hazardous materials over long distances. In an event of derailment or accident, the tank car is likely to puncture or fracture resulting in human injuries, fatalities, environmental and property damages (Example: Derailment in Quebec, 2013).
- A new low-carbon steel with excellent properties in normalized and post weld heat treated condition was developed by ArcelorMittal to improve the safety of tank cars transporting flammable liquids.
- Finite element simulations showed that the impactor does not puncture the tank jacket made up of new steel at lower velocities. At higher velocities, the new steel absorbs more impact energy than the current steel and delays the puncture process.

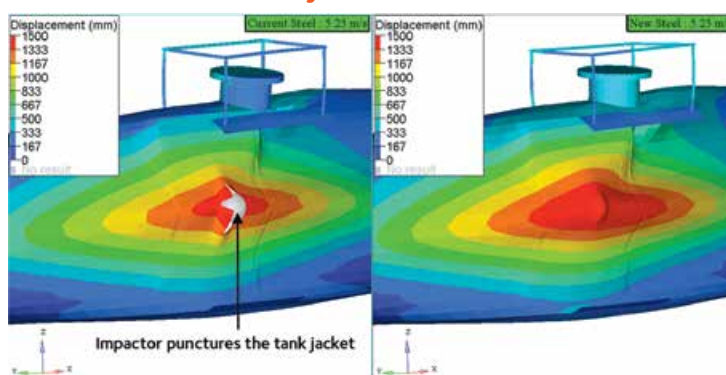


Derailment in Quebec, 2013

Finite element model of tank car



Finite element model sectioned to show deformation from inside of the tank jacket



Puncture simulations were performed using ductile damage model available in Abaqus software package.



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