Depressing process equipment in response to fires, leaks, pipe ruptures or other hazards, as well as for planned shutdowns, is critical to safe operation, notes Honeywell. Accurate design of blowdown systems is therefore essential. Blowdown system design focuses on two main areas: • **sizing** of components such as relief valves, orifices, piping and vessels to allow safe and rapid depressuring; and • **selection** of construction materials for pipes and vessel walls, which have to withstand very low temperatures resulting from auto-refrigeration effects during rapid depressurization – further complicated by uneven temperature distribution and consequent differential expansion and contraction in pipe and vessel walls. The second consideration requires system designers to consider the risk of brittle failure in process equipment and piping.

Process simulation tools meet these requirements to a certain extent, enabling users to predict minimum temperatures and relief loads, and select appropriate materials and component sizes. However, this approach is typically inefficient, because most models remain relatively inaccurate, lacking sophistication to model the temperature changes and loads accurately. To allow for this, designs are often overly conservative to ensure safety. Since the materials selected for resistance to very low temperatures are expensive, this over-design is costly.

The new Blowdown Utility in Honeywell’s UniSim Design Suite addresses this problem. Adopting a modeling approach consistent with the API 521 6th edition guidelines for the fire method, it improves accuracy through features including: calculations representing the non-equilibrium conditions that occur in a vessel during depressuring; flowsheeting capabilities for blowdown network design; blowdown scheduling to allow phased depressurization; and a two-dimensional (axial and radial) heat transfer model for highly accurate calculation of the temperature profile for vessel and pipe walls. The new tool has been rigorously tested and extensively validated.

Providing far more accurate models, this solution enables engineers to design safer blowdown systems and at the same time to avoid costly over-design. The UniSim Design Blowdown Utility is also the first tool in the market that gives the engineer the ability to accurately model the blowdown of a flowsheet with blowdown scheduling.

The UniSim Design Blowdown Utility increases accuracy and cuts over-design

**Avoiding low-temperature embrittlement when depressuring equipment may involve expensive over-design, says Honeywell, whose new design tool promises better accuracy**

**Blowdown simulation: Safe, but at what cost?**