# Crushable foam wrap

## Preventing excessive pressure

Crushable foam wrap is an engineered syntactic foam, comprised of a thermoset resin and hollow glass microspheres (HGMS). The solid-state composite material is typically manufactured in curved quadrants and adhesively bonded to the outer diameter of the inner casing string in the annulus targeted for APB mitigation. These foam quadrants are designed to collapse at a predetermined temperature and pressure resulting in a volume reduction of the crushable foam wrap material (typically 20 % to 25 %) and a subsequent increase in available annulus volume where fluid may expand, without further increases in pressure, as heat is transferred to the annulus from the production fluid.



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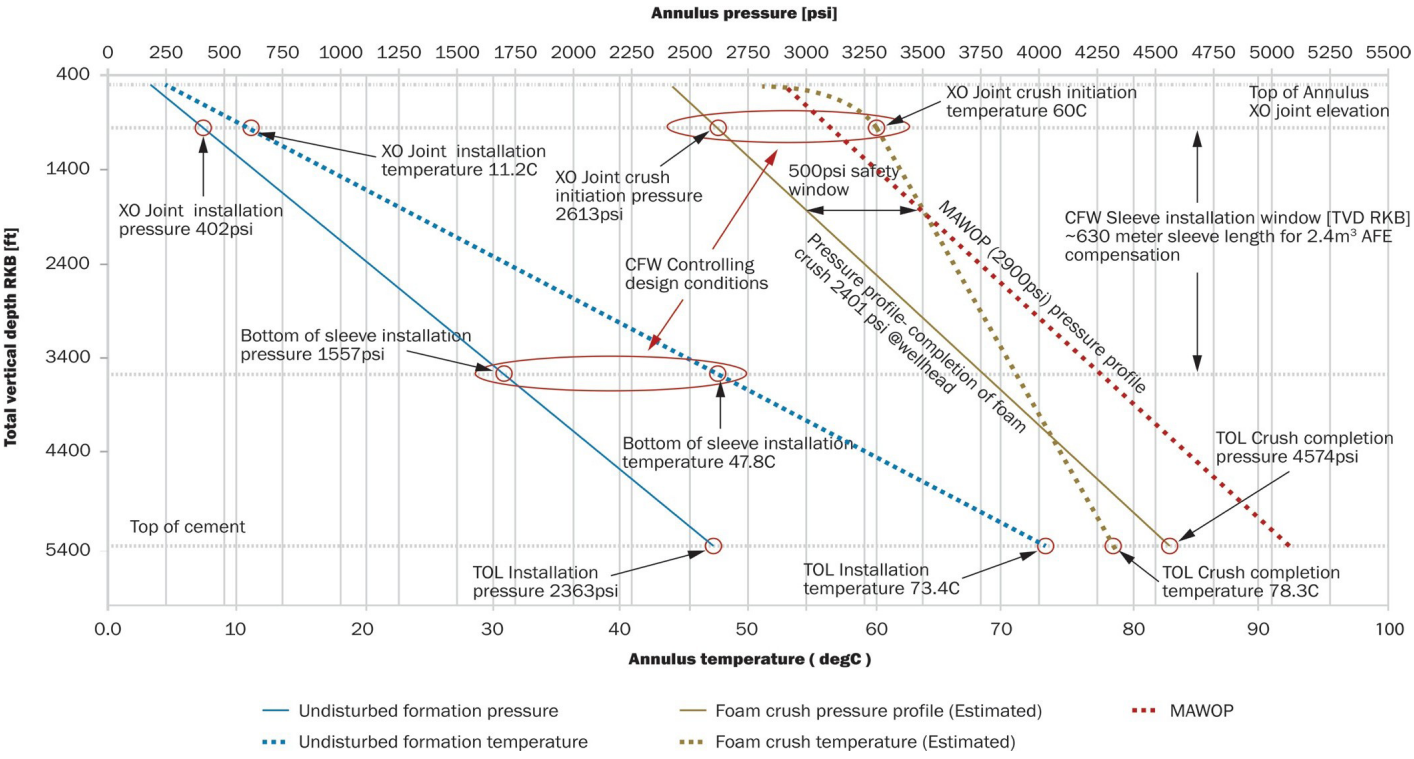
AIS has been formulating and manufacturing crushable foam wrap for decades and has had successful deployments on dozens of wells around the globe.

## Well design

Design of the sleeve ensures survival of the crushable foam wrap quadrants during installation of the casing string, accommodating both annulus installation temperature and pressure, guaranteeing full retainment of collapse volume availability after sealing of the annulus.

Integrity of the casing program is maintained through crush of the complete sleeve, designed to occur before the maximum allowable operating pressure in the annulus is experienced; facilitating expansion of the annular fluid into the newly available volume and achieving the mitigated steady-state operating pressure profile.

Crush initiates at the bottom of the foam column, once the collapse pressure and temperature of the foam is reached and propagates up along the sleeve until the complete column has crushed and full increase in the annulus volume has been achieved.



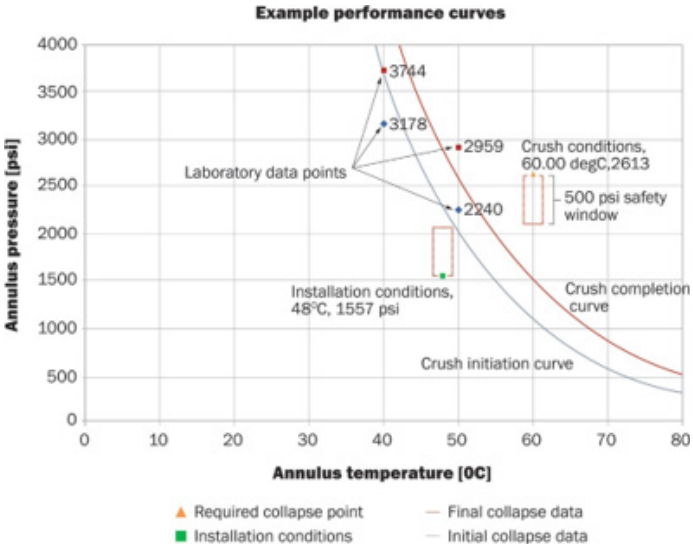

### Benefits

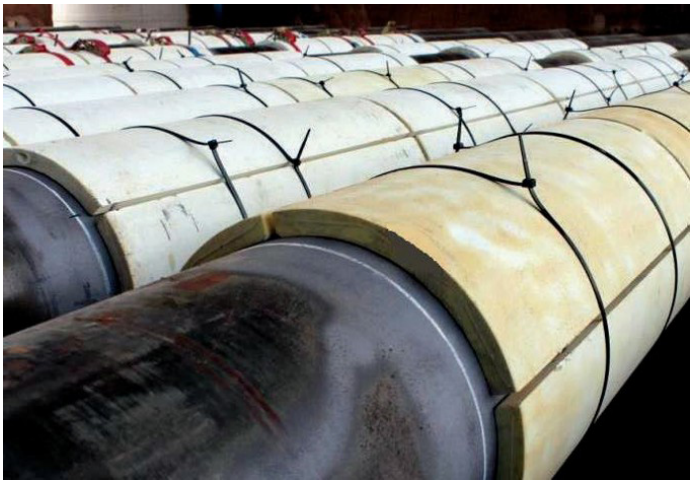
- Honeycomb microstructure
- Tailored structure
- Flexible positioning
- Guaranteed performance

### Applications

- Inner drill casing

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## Design benefits

Crushable foam wrap is classified as a Type II APB mitigation technology, allowing the crushable foam wrap sleeve to be easily installed on a wide range of casing sizes, without affecting the base pipe itself, and does not change the well design or the equipment used during well construction.

As the sleeve is adhesively bonded to the outer diameter of the pipe there is no effect to the structural strength of the casing pipe and the annulus remains isolated after mitigation has occurred.

The mitigation response of crushable foam wrap is non-mechanical, eliminating the risk of equipment malfunction resulting from improper installation or degradation over time. Design of the sleeve from ancillary quadrants affords flexibility in the location of the sleeve with respect to wellbore elevation and fluid circulation. Through the combination of various grades of HGMS and resins, crushable foam wrap sleeves can be tailored to accommodate the operational envelope of almost any well environment.

Crushable foam wrap is an inert material compound and poses no health or safety risks to individuals involved in the transportation or installation process.

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