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GLASS-LINED
& ALLOY SYSTEMS

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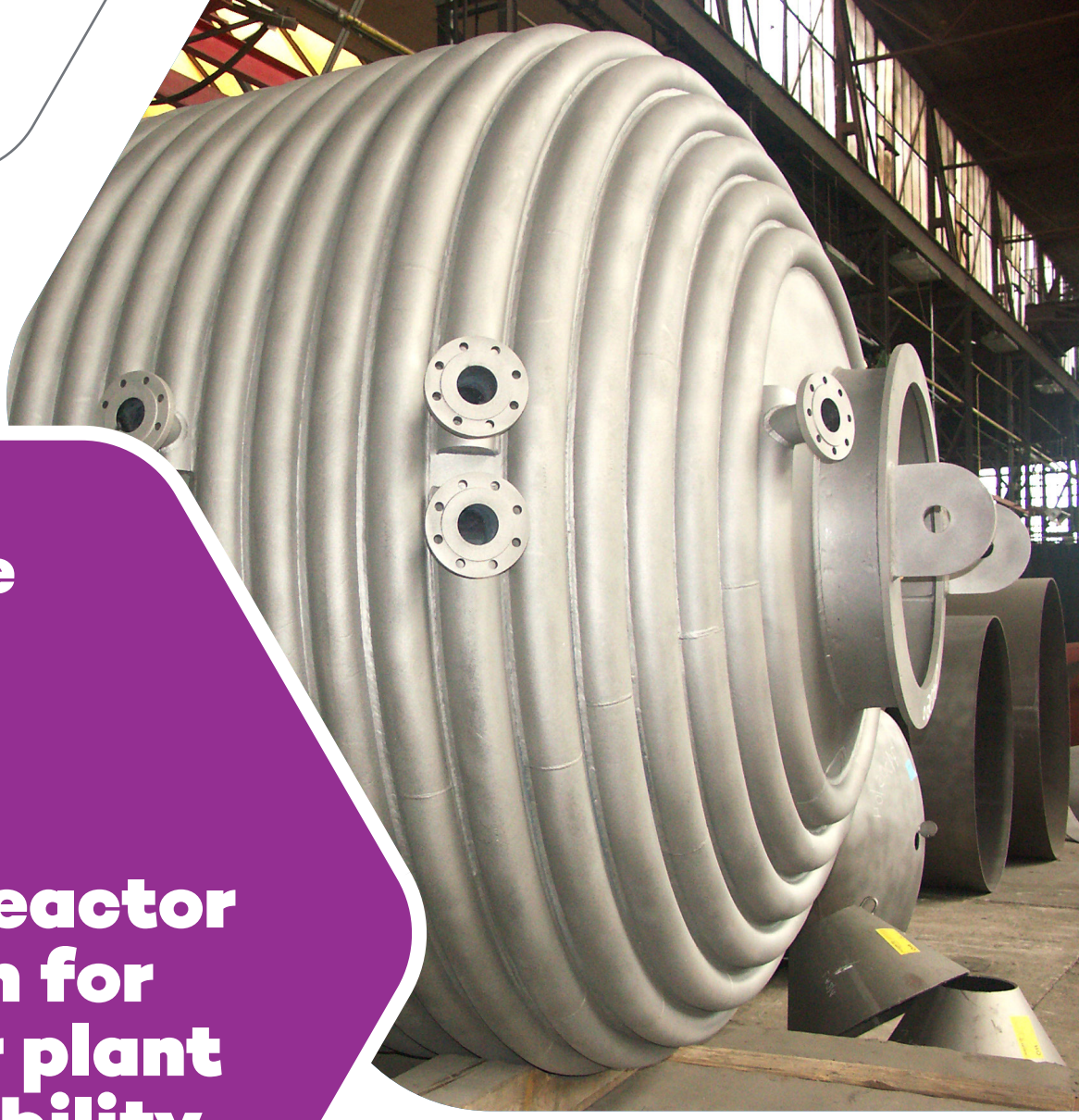

When the half-coil starts leaking...

New Reactor Design for higher plant availability.

- **Damage profiles**
- **Causes**
- **Remedies**

THERE IS NOTHING THAT COULDN'T BE IMPROVED

This also applies to Equipment Design we have all known for more than thirty years such as the glass-lined reactor with a half-coil pipe Jacket.
Originally developed by Pfaudler, this reactor design is the optimum solution for a number of selected processes. One criteria calling for a reactor with a half-coil pipe is high pressure (i.e. more than 10 bar) on the heating/cooling medium side.

THE RISKS

As the half coils are attached to the outer reactor wall already before the glass is applied, they are repeatedly heated together with the reactor to temperatures above 850 °C, the temperature needed for glassing. It is obvious that this cannot be accomplished without affecting the properties of the half-coil pipe material.
The inner surfaces of the half coils get scaled, and the result are partial decarburization at the edges and structural transformations on the steel surface inside the pipe. These changes may result in a local deterioration of the yield point and a reduction of the antifatigue properties of the half-coil pipe material.

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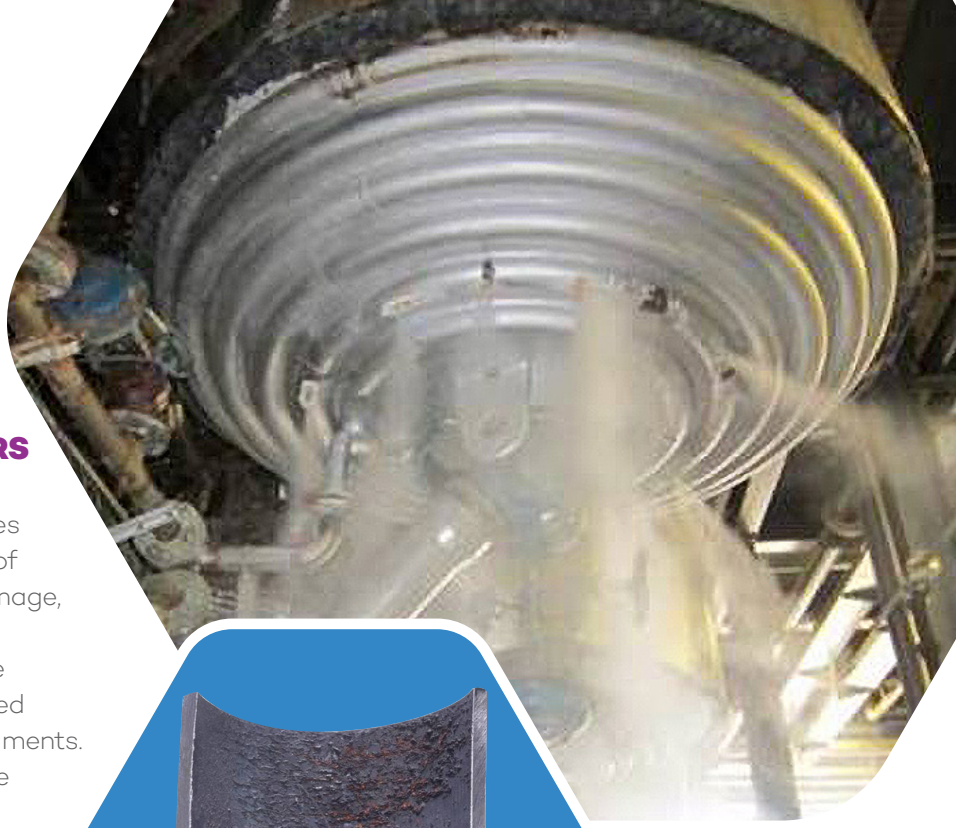

DAMAGED PROFILES ON REACTORS WITH HALF-COIL PIPES

Practical experience has shown that damages to half-coil pipes normally occur in the area of the lower reactor head. As a result of the damage, the half-coil pipe starts leaking.
Cracks occur both in the homogeneous base material of the half-coil pipe and in the welded seams at the butts of the individual pipe segments. The half-coil pipe in the cylindrical part of the reactor is not usually damaged.

The figure to the right shows a view of the inside of the half-coil pipe at the lower head in the area of a butt joint between two pipe segments.

The distinct crack structures are clearly visible. Identify the problem - avert risks Pfaudler has thoroughly analyzed the mechanisms leading to the damages and material transformations described above and developed a method that is referred to as the Pfaudler CleanCoil Method. A special pretreatment of the half-coil pipe in connection with optimized temperature control during glass application is designed.

ALTERNATIVE NEW REACTOR DESIGN

In addition to the Pfaudler Clean Coil process, Pfaudler supplies a new design combining the benefits of half coil and jacketed reactors. The shell of the reactor is still manufactured with half coils for heating and cooling, but the more critical half coils in the bottom area are replaced by a jacket bottom end.

Benefits of the new Pfaudler reactor design:

- No risk of damage/ leakage of half coils in the bottom area;
- Increased heat transfer vs half pipe coils due to higher available heat transfer surface;
- Higher operating pressure than fully jacketed reactor due to half coils in the shell area;
- Longer lifetime by avoiding half pipe coils at the bottom dish.

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