

Achema 2024:

Topic: #process: Safety and Security

Session: Development of improved devices
and components enabling
highest safety levels

Green Bursting Disk Technology

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Green Bursting Disk Technology

Background:

Bursting Disk Devices are a well established pressure relief technology.

Typical characteristics include

1. Accurate set pressure
2. Very fast opening when activated
3. Reliable large opening / flow area
4. Excellent leak tightness



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New Engineering Challenge:

Sustainability Requirements Drive Industry Users and Manufacturers to...

1. Use less raw material
2. Consume less energy
3. Reduce water consumption
4. Design with 'end of life disposal' and 'recycling' in mind
5. Reduce and remove employee exposure to hazards

...while retaining reliability, accuracy, and compliance to safety device Standards (which are the Pressure Equipment Directive in the EU, ASME in the USA, and the widely used ISO Standard series 4126).



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Established Technology:

Established high performance Bursting Disk Technology is focused on the use of the following design and construction features;

- Solid metal construction which optimizes leak tightness
- Reverse buckling structures to control the set pressure (burst pressure controlled by shape)
- Lines of weakness (score lines) to provide controlled opening during activation with repeatable strong flow characteristics
- A hinge member to manage control of fragmentation



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How Is Established Technology Performance Achieved?

Typically requires...

- a. Heat treatment(s) to stabilize the burst pressure after forming and scoring steps
- b. A 2nd piece of material as a hinge to control fragmentation, that can be much thicker and heavier than the bursting disk itself.

These aspects of design and construction provide scope for continuous improvement focused on sustainability themes.





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Green Technology Bursting Disk Solutions:

Move beyond the limitations of mechanical scoring which prefers to be in an X shape...

Or circular pattern...





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Green Technology Bursting Disk Solutions:

Introduce new shapes to
lines of weakness
through the use of laser
technology...



Score line curl

US and International Patents Pending

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Green Technology Bursting Disk Solutions: **The Score Line Curl**

- Develops an integral hinge when the bursting disk activates
- Retains the bursting disk petal
- Develops excellent opening characteristics
- Permits the 2nd component hinge to be eliminated

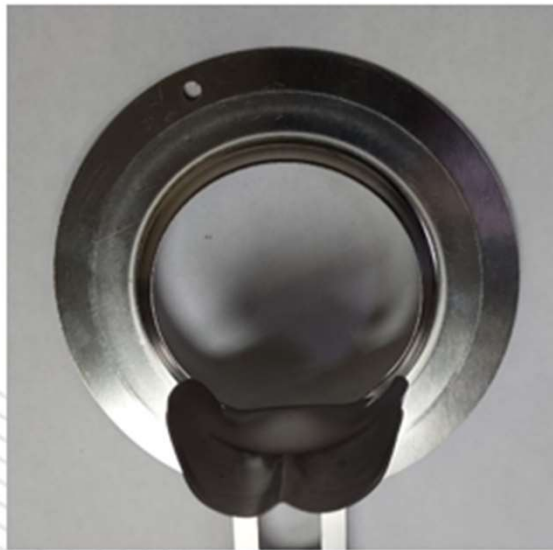


US and International Patents Pending

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The Score Line Curl:

- Improves opening characteristics
- Identified by 'Flow Resistance Factor' or K_r value (refer EN 4126 & ASME)
- K_{rgl} 0.59 applicable to gas and liquid service; good quality opening



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Additional Sustainability Benefits:

Reduced Material = Reduced Weight = Reduced Energy

- **Less energy consumed to make the raw material;**
- **Less energy consumed to ship the lighter weight product**

Product design with minimization of raw material.



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Additional Sustainability Benefits:

Weight Reduction Examples...

- **DN50 Type LSR Disk, burst pressure 4 bar has a typical 73% weight reduction**
- **DN100 Type LSR Disk, burst pressure 10 bar has an 80% weight reduction**

Leads to reduction in shipping and handling costs, which contribute meaningful reductions in energy consumption benefitting the 'total cost of ownership' for bursting disk devices.

US and International
Patents Pending



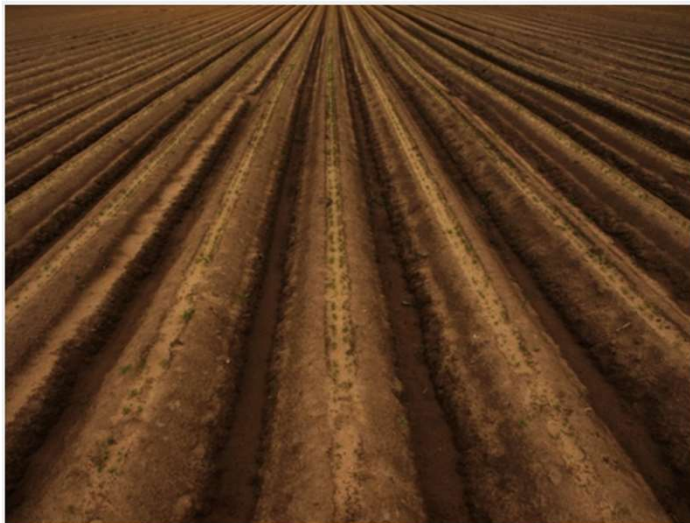
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Additional Sustainability Benefits:

Avoidance Of Heat Treatment

Mechanical scoring 'ploughs' a furrow in the material which increases stress that must be removed by heat treatment.

Material is displaced during the scoring action.

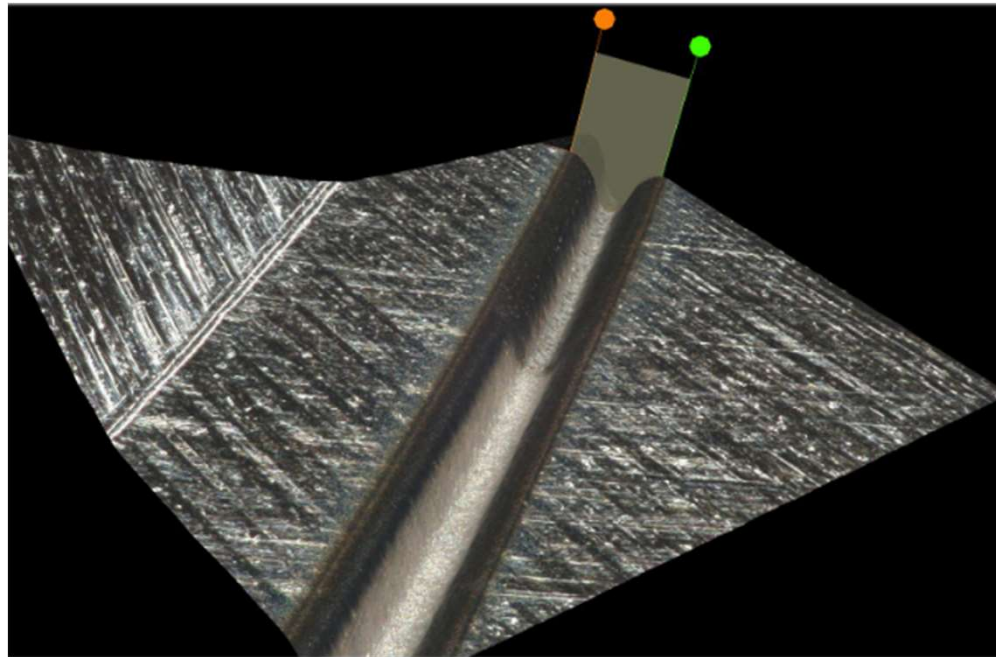


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Additional Sustainability Benefits:

Avoidance Of Heat Treatment

Laser scoring 'removes' material with little stress added to the material – usually no heat treatment!



**Removed material is vaporized with no obstructions.
Note the uniformity of shape in the laser scored 'valley'**



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**Direct Benefits:
Reduced Holder
Material**

Most Bursting Disk Devices are used in Holders to achieve their intended performance. Creative casting design is reducing Holder weight by between 18% and 34%.

**Material Reduced Cast
Holder Design
Type SRI-7RS**



**Traditional
Rectangular Holder
Design Type SRB-7RS**





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Direct Benefits: Reduced Holder Material



SRI-7RS™ 

**unique cast shape
minimizes material**

US and International
Patents Pending



Unique angular shape accommodates pre-torqued capscrews & ensures appropriate centering in a wide range of pipe flange configurations (e.g. EN1092, ANSI, JIS).





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Direct Benefits: Reduced Holder Material



SRI-7RS™ 

**unique cast shape
minimizes material**

US and International
Patents Pending



Unique angular shape accommodates multiple companion flange bolting specifications / pressure ratings, allowing 1 shelf stock item to cover multiple applications.





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**Indirect Benefits: Reduced Energy Consumption
- Reduced weight of Bursting Disk & Holder**





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In Conclusion:



**Nurturing Sustainability Through a
Commitment to Safety Technology**





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Questions?

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