The application of the PED on the design codes for cryogenic equipment and future developments foreseen in this field
Summary

- Background

- PED – Advantages for the Industry

- PED – Inconveniences for the Industry

- PED – Main changes compared to national regulations

- PED – Notified Body

- PED – Category and module

- PED – EN and ISO Standards published for pressure vessels

- PED – Recent modifications
Background

- PED: Pressure Equipment Directive
- First version published in 1997, came fully into force on May 2002
- First revision in 2014.

- PED covers **Static Pressure Equipment**
- Some cylinders are also covered by PED
- PED only covers **design**, **manufacturing** and **firstplacing** on the market
- PED is **mandatory** in European union since end of May 2002
PED – Advantages for the Industry

- Same design can be used in all European Union countries
  - Allows manufacturers to optimize design and to reduce manufacturing cost

- Approval from only one notified body is necessary
  - Allows to obtain better conditions from notified Bodies
  - Allows to “open” difficult markets/countries

- Should allow a company to harmonise PE fleet in European Union
  *Not always possible because of different practices in the different countries e.g. different service pressures or safety accessories*

- Also recognized in Eastern European countries
PED – Inconvenients for the Industry

- Sometimes more stringent than old national codes
  - For materials
  - For safety accessories
  - Vaporisers are considered as pressure vessels

- May lead to cost increase
PED – Main changes compared to national regulations

- All vessels > 0,5 bar are subjected
- Pressure test (coefficient: 1,43)
- Pipes > DN 25 to be PED compliant
- The entire control cabinet (with accessories > DN 25) to be PED compliant
- Risk analysis to be submitted to the Notified Body
- Choice of a Notified Body per product line
PED – Notified Body

PED allows the cryogenic vessel manufacturer to choose a unique Notified Body as per the following criteria:

- Qualification and capability
- Wide recognition, even outside the European borders
- Close collaboration
- Competitiveness
For cryogenic vessel for LIN, LOX and LAR

- Risk category IV
- Module G (unit CE approval)
- Or Modules B + D
  - CE type approval
  - Production quality assurance
### Vessels

<table>
<thead>
<tr>
<th>ISO reference</th>
<th>EN reference</th>
<th>Title</th>
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<tbody>
<tr>
<td>EN ISO 21009-1*</td>
<td>EN 13458-1</td>
<td>Static vacuum insulated vessels Part 1 (ISO and EN): Fundamental requirements</td>
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<tr>
<td>EN ISO 21009-2</td>
<td>EN 13458-3</td>
<td>Static vacuum insulated vessels Part 2 (ISO) Part 3 (EN): Operational requirements</td>
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<td>EN 14197-1</td>
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<td>Static non-vacuum insulated vessels Part 1: Fundamental requirements</td>
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<td>EN 14197-2</td>
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<td>Static non-vacuum insulated vessels Part 2: Design, fabrication, inspection and tests</td>
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<td>EN 14197-3</td>
<td></td>
<td>Static non-vacuum insulated vessels Part 3: Operational requirements</td>
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* Under revision
## PED – EN and ISO standards published for pressure vessels

### Accessories

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ISO 21011*</td>
<td>EN 1626</td>
<td>Valves for cryogenic services</td>
</tr>
<tr>
<td>EN ISO 21012*</td>
<td>EN 12434</td>
<td>Hoses</td>
</tr>
<tr>
<td>ISO 21013-1*</td>
<td>EN 13648-1</td>
<td>Pressure relief devices Part 1: Reclosable pressure-relief devices</td>
</tr>
<tr>
<td>ISO 21013-2*</td>
<td>EN 13648-2</td>
<td>Pressure relief devices Part 2: Non-reclosable pressure-relief devices</td>
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<tr>
<td>ISO 21013-3*</td>
<td>EN 13648-3</td>
<td>Pressure relief devices Part 3: Sizing and capacity determination</td>
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<tr>
<td>ISO 21013-4*</td>
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<td>Pressure relief devices Part 4: Pilot operated pressure-relief</td>
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<tr>
<td>EN ISO 24490*</td>
<td>EN 13275</td>
<td>Pumps for cryogenic vessels</td>
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</tbody>
</table>

* Under revision
## PED – EN and ISO standards published for pressure vessels

### Materials

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<tbody>
<tr>
<td>ISO 21010*</td>
<td>EN 1797</td>
<td>Gas/materials compatibility</td>
</tr>
<tr>
<td><strong>EN ISO 21028-1</strong>*</td>
<td><strong>EN 1252-1</strong></td>
<td>Toughness requirements for materials at cryogenic temperature</td>
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<tr>
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<td><strong>EN 1252-2</strong></td>
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### Miscellaneous

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<tr>
<td>ISO 21014*</td>
<td>EN 12213</td>
<td>Cryogenic insulation performance</td>
</tr>
<tr>
<td>ISO 23208*</td>
<td>EN 12300</td>
<td>Cleanliness for cryogenic service</td>
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</tbody>
</table>

* Under revision
PED – Recent modifications

To re-qualify cryogenic vessels, original documents of design and manufacturing must be presented to the Notified Body.

Cryogenic vessels are generally built according to different national construction code:

- French code
- German code
- Belgian code
- Dutch code

Documents to be supplied:

- Drawing of approval
- Annex to the drawing of approval (device’s description)
- Calculation of internal bowl
- Certificate of hydraulic test (event)

- Operating modes of soldering
- Qualifications of the welders
- Report of the radiographic examinations
- X-ray
End of presentation
Thank you for your attention