LPG Composite Cylinder
LPG COMPOSITE CYLINDER
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There are three major cylinder characteristics that impact design and component selection.

> Weight
> Durability
> Cost
Cylinder Components

HDPE Liner
Blow molding

LPG pressure valve
Local purchase part

Fiber reinforcement
Filament Winding

Imported Components:
Epoxy Resin
Glass Fiber

Housing
Injection molding

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Gas pressure is dependent from Temperature

Required Burst Pressure

Activation pressure safety valve

Testing Pressure

Burst pressure of Composite Cylinder is at 160 bars!

The burst pressure is 2.4 times higher than of steel cylinders.

C₃H₈ ==> Propane

C₄H₁₀ ==> Butane
# Technical Comparison between Composite Cylinder Manufacturer

<table>
<thead>
<tr>
<th></th>
<th>Competitor Technology</th>
<th>Competitor Technology</th>
<th>APTech Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liner</td>
<td>HDPE blow molding</td>
<td>PET stretch blow molding</td>
<td>HDPE blow molding</td>
</tr>
<tr>
<td>Cylinder Housing</td>
<td>HDPE</td>
<td>HDPE</td>
<td>PP</td>
</tr>
<tr>
<td>Top / Bottom housing</td>
<td>Welded together</td>
<td>Welded together</td>
<td>One way clip ➔ simple replacement</td>
</tr>
<tr>
<td>RFID</td>
<td>optional</td>
<td>optional</td>
<td>Included, traceable</td>
</tr>
<tr>
<td>Resin</td>
<td>2 component system ➔ pot life 20 – 30 min</td>
<td>2 component system ➔ pot life 20 – 30 min</td>
<td>1 component ➔ unlimited pot life</td>
</tr>
</tbody>
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## Technical Comparison between Composite Cylinder Manufacturer

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<tbody>
<tr>
<td>Cylinder curing time</td>
<td>~ 120 minutes</td>
<td>~ 120 minutes</td>
<td>4 minutes</td>
</tr>
<tr>
<td>Cylinder curing system</td>
<td>oven</td>
<td>oven</td>
<td><strong>UV free</strong> LED Light</td>
</tr>
<tr>
<td>Curing energy costs</td>
<td>Very high</td>
<td>Very high</td>
<td><strong>Very very low</strong></td>
</tr>
<tr>
<td>Cylinder rejects due to curing energy lost (20 min)</td>
<td>~ 350 Cylinder ~ USD 20 000</td>
<td>~ 350 Cylinder ~ USD 20 000</td>
<td>0 Cylinder USD 0, (BATTERY)</td>
</tr>
<tr>
<td>Styrene smell in factory</td>
<td>High</td>
<td>High</td>
<td><strong>Very little</strong></td>
</tr>
<tr>
<td>Cylinder Housing replacement</td>
<td>Difficult, risk of cutting into cyl.</td>
<td>Difficult, risk of cutting into cyl.</td>
<td><strong>Very easy, clip</strong></td>
</tr>
<tr>
<td>Test Cylinder recycling concept</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
No design change for almost 100 years
No technical improvement
Corrosive
High maintenance
Unstable Cylinder stacking
Minimum safety features
No alternative for LPG user

**Remark:**
During a fire, the pressure relief device (PRD) releases the gas pressure with a flame of up to 10 m. If the pressure increases further due to overheating, the PRD does not have sufficient time to release the pressure; the cylinder can explode or reach **B.L.E.V.E.** effect.  
(Boiling Liquid Expanding Vapour Explosion)

**APTech’s Composite LPG Cylinder**

- **Explosion proof under fire exposure**
- Visual control of filling level (full/empty control)
- No danger through overfilling (more than 85 %)
- Empty weight is 50 % less than steel cylinder
- No Corrosion
- Cylinder housing can be recycled
- Modern design for today’s needs (user, transport, handling)
- High Safety Performance and certification (SIRIM, TUV, ISO)
- Electronic chip for identification and cycle control
- Easily branded
Additional Technical Features

- Each Cylinder is equipped with RFID (manufacturing data, Lot number).

- Cylinder is almost maintenance free and needs only tech. inspection according international intervals (pressure re-test after 10 years).
RFID Flow Chart

Cylinder Servicing Station

- Retesting / Detecting of bad cylinders
- Acquires data about each cylinder
- Applies the company code to the cylinders

Wireless Network

- Measures the weight of the cylinders before filling
- Measures the remaining amount of Gas in the cylinder
- Measures the amount of gas needed to fill the cylinder
- Starts the filling process

DATA

- Data on the cylinders
- The distributor
- The remaining amount in the cylinders
- The amount needed to fill the cylinders

Manufacturers
- Distributors
- Retesting companies

- Data on the cylinders
- Warehouses cylinders
- Delivery particulars
- Inputs the test results

RFID Handheld Reader

Internet

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LPG Composite Cylinder Properties

- Composite Cylinder will not explode
- According Customer Specification
- Customer Logo + embossed text
- Level Indicator, RFID
- Cylinder is el. conductive, optional
- L-Ring for handling
- Soft Grip at handle, optional
- Locking Ring (Top / Bottom)
- Stackable
- No rust from inside (moisture from gas)
- Safety Valve in correct position
- Housing recyclable
- Own Patents and Trade Marks
- Affordable pricing

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Benefit for Gas Companies

- Highest worldwide recognized SAFETY STANDARDS, Cylinder will not explode!
- Consumer friendly product with “State of the Art design”
- Reduced transport cost for gas distribution per truck (20 t → 14 t [less by 30 %])
- No re-painting of cylinder is required
- No dents or rust on cylinder housing
- Housing is easy to clean
- Housing can be recycled
KNOW HOW AND TECHNOLOGY

- One patent is in final approval process
- One patent is filed and in registration process
- Resin supplier developed tailor made resin
- Energy saving curing system
- Raw material and component supplier are secured
- Equipment supplier are secured
- TUV is standby for testing and monitoring production

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Thank you very much for your time and interest in this presentation!

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