An Environmentally-Friendly Production Plant of Pharmaceutical IV Bags

A Success Story
OUTLINE

- Who we are
- Intravenous Bag (IV) Manufacturing 101
- Smart Manufacturing
  - Building
  - Raw Material
  - Energy
- Green Impact

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08/12/2014
Who we are

- Established 1998 – 22000 m² plot, rural area, green surrounding
- Manufacturer of IV bags and accessories: New generation bags
- Complete manufacturing cycle – Unique in MENA region
- 2006: Complete destruction
- 2007: cooperation with UNIDO - Inspiration
- 2009: Re-building Started
- 2014: Customer Trials
Intravenous Bag (IV) Manufacturing 101

Building Layout

Clean rooms different classes
- Outside
- Transition
- Class 100,000
- Class 10,000
- Class 1000
- Class 100

Ware house
- Cool Area & Segregation

Raw Material
- Finished product

Services
- Electricity
  - (EDL/Gen1,2,3/UPS)
  - Chillers
  - Compressors
  - Cooling Circuits
  - Air Conditioning/AHU
Intravenous Bag (IV) Manufacturing 101

Conversion

- Extrusion of Film and Tubes
- Injection Molding of Ports and Injection Sites
- Assembly to finished bag
- Forming of outer pack

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Building Improvements

All concrete structure:
- Double outside walls

Cool loop water tank:
- Underground – 100 m³
- Uniform temp year round

Smart layout:
- Compressors & Chillers cool year round

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Raw Materials

- Film down-gauging from 0.36 to 0.21 mm
- SG bonus: 1.22 to 0.9 g/cc

Shift from PVC to PP

- PVC bags banned or restricted
- Plasticizer & phthalate-free
- Extremely low extractables
- Environmentally friendly
Smart Manufacturing

Energy Saving

- **Building Insulation**
  - Cooling capacity: 100 tons -- 60

- **Lighting**: All LED
  - 60 amps to 10 amps

- **Chillers**
  - Modular: Small cap 15 Tons & large cap 25 Tons
  - Cool location: 5 to 10% increase in efficiency

- **Extrusion lines**
  - AC vector drive motors
  - Heaters blankets/Insulation
  - Closed loop cooling of feed throats

- **Compressors**
  - 60 KW to 45 KW
  - Variable drive: air as needed
  - Cool location: 5 to 10% increase in efficiency

- **Injection Machines**
  - **Hybrid technology**:
    - * No need to cool hydraulics
    - * Electric Motors 30% saving
    - * Closed loop cooling of feed throats & hydraulics
  - **Molds**:
    - * Hot runners: 40% material saving
    - * Closed loop cooling
Smart Manufacturing

Future projects

Solar Energy: Synchronization with main power supply (1600 m² flat roof)
Geothermal loop for “hot” water cooling

Limitation

$ / Euro / LBP
## Green impact: Summary

<table>
<thead>
<tr>
<th></th>
<th>PVC Plant 2006</th>
<th>New Gen. PP Plant 2014</th>
<th>Saving (%)</th>
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</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>500 KW Peak</td>
<td>175 KW Peak</td>
<td>65%</td>
</tr>
<tr>
<td><strong>Raw Materials</strong></td>
<td>400 Tons</td>
<td>155 Tons</td>
<td>61%</td>
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<tr>
<td>(12 MM IV Bags)</td>
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<tr>
<td><strong>Water Recovery</strong></td>
<td>80%</td>
<td>99%</td>
<td>24%</td>
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<tr>
<td><strong>RM recycle</strong></td>
<td>20%</td>
<td>2%</td>
<td>90%</td>
</tr>
<tr>
<td>(Waste generation)</td>
<td></td>
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<tr>
<td><strong>Packaging</strong></td>
<td></td>
<td></td>
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<tr>
<td><strong>Boxes</strong></td>
<td>15000</td>
<td>10000</td>
<td>33%</td>
</tr>
<tr>
<td><strong>Film</strong></td>
<td>2.5 Tons</td>
<td>0.5 Tons</td>
<td>80%</td>
</tr>
<tr>
<td><strong>Spent Motor Oil</strong></td>
<td>2 Tons</td>
<td>0.4 Tons</td>
<td>80%</td>
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<tr>
<td><strong>Carbon Foot print</strong></td>
<td>?</td>
<td>?</td>
<td>?</td>
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