DVC PROCESS TECHNOLOGISTS
www.dvcprocesstech.com

CONSERVE ENERGY, SAVE ENVIRONMENT

SOYBEAN OIL PROCESSING:
TECHNOLOGY UPDATES

SOPA INTERNATIONAL
SOY CONCLAVE

10th October 2019

ABOUT US..

• DVC Process Technologists is an Original Equipment Manufacturer with strong presence in Oils & Fats Processing and related industries since 2001.
• DVC is a one point solution provider for design, manufacture, supply, installation & commissioning of process plant & equipment for Refineries including by-product like Gums (Lecithin) Drying & Acid Oil.
• DVC also provides Solvent Extraction Plants (including Flash Desolventization) and Biodiesel & Oleochemical Plants
• DVC has its own ISO Certified manufacturing facility near Pune.
• DVC has dedicated Customer Service Team to conduct technical audits and provide solutions to upgrade the existing plants to improve efficiencies, quality, yield, capacity & automation.
• Other verticals include food processing projects and cold storage.
ACHIEVEMENTS

• Over 163 references including Europe, USA, Australia, Middle East & Africa.
• 45+ Lecithin Plants including Medical Grade.
• > 50 Green Field Projects
• Introduced Gums (Lecithin) Drying Plants for Rice Bran Oil.
• Introduced Thermosiphon heating systems and Automation in small capacity plants.
• Successful Supply & Commissioning of Flash Desolventising Plant.
• Repeat Orders from several customers including MNCs.
THE DVC ADVANTAGE

- Dedicated team of technocrats and engineers with vast experience in Oils & Fats and allied industries
- In-house designing, automation and manufacturing giving streamlined operation for fast delivery and stringent quality management.
- One Point Turnkey Solution provider including Tank Farm Automation, Optimum Sizing of Utilities and Minimum Energy losses.
- Dedicated customer support team for spares and after sales support.
EVOLUTION OF SOYBEAN OIL PROCESSING

• 1960 – Early 80’s
  Batch Process
  Small Capacities

  Disadvantages
  High Losses
  Inconsistent Quality
  High Energy Consumption

  Advantages
  Unknowingly Trans-fats levels remained in control

UPDATES IN REFINING
DEGUMMING & NEUTRALIZATION
- Separator based
- Combined Degumming & Neutralization
  - loss of lecithin
  - problems in soapstock splitting
- Water Washing / Silica Treatment
- Physical Refining
  - Total Degumming
  - Enzymatic

LONGMIX NEUTRALIZATION
- In India, DVC introduced & established systematic LONG MIX Neutralization process.
- Reduction in excess chemicals
  Caustic Lye excess reduced from 20% to 5%
- Conditioning of NHP and removal along with soapstock
  P content < 15 ppm
  Ease in further processing
- Low wash water requirement
due to less soap carryover

<table>
<thead>
<tr>
<th></th>
<th>P content (ppm)</th>
<th>FFA (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude</td>
<td>500 – 900</td>
<td>0.4 – 1</td>
</tr>
<tr>
<td>Water Degummed</td>
<td>120 – 200</td>
<td>0.4 – 0.8</td>
</tr>
<tr>
<td>Neutralized &amp; Washed</td>
<td>10 – 15</td>
<td>0.1</td>
</tr>
</tbody>
</table>
**BLEACHING**

- Pressure Leaf Filters
  - Horizontal / Vertical
- **Pre-Treatment**
- Earth Dozing & Slurry Preparation
- Bleacher
  - True Retention
  - Mechanical Agitation
  - Wet Bleaching
- **Pre-Filtration**

<table>
<thead>
<tr>
<th></th>
<th>Peroxide Value</th>
<th>Fe Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - 5 ppm</td>
<td>&lt; 0.5 mEq/kg</td>
<td>&lt; 0.1 ppm</td>
</tr>
</tbody>
</table>

**DEODORIZATION**

- Semi Continuous & Continuous
- Heat Regeneration - Under Vacuum
- Final Heating
  - Under vacuum
  - Thermo-syphon: for zero contamination of mineral oil
- Structured Packing for Efficient FFA Removal
  - Live steam used for deodorization is further used for stripping duty – helping in optimizing motive steam consumption.
- True Retention & **No Splash Oil generation**
**LOWTRANS® DEODORIZATION**

**Dual Temperature Deodorization:**
- **Trans fatty acid isomer content < 0.5%** and keeping check on 3MCPD generation side reactions
- **PUFA: 57 – 58%; Linolenic: 7 – 8%**
- **Control on Time, Temperature & Vacuum**
- **Efficient stripping for FFA removal**
- **Optimum Deodorization temperature and retention time combination**
- **Operating Pressure: 1.25 Torr**

---

**REGV®**
Regenerative Vacuum Heat Exchanger

**FEVAC®**
Vacuum Final Heater

- User Friendly, maintenance free
- Cylindrical design with no restriction on testing pressure
**TWO STAGE SCRUNBBING**

- Optimized separation between FFA & micronutrient streams like tocopherols.
- No extra processing cost
- **Higher Tocopherol yield in alkali refined soybean oil (about 11%)**
- Adds premium to both the products
- Can be installed in existing systems with evaluation

---

**VACUUM SYSTEMS**

- Conventional Booster, Ejector & Condenser
- Chilled Water
  - Elimination of contaminated water cooling tower
  - Steady vacuum even if fluctuation in cooling water temperature
  - Elimination of problem of odour
  - Reduction in Steam & Cooling Water but increase in Power.
- Ice Condensation
**GUMS (LECITHIN) DRYING**

- Scrapped Surface Falling Film Technique
- Short contact time
- No deterioration to product due to overheating
- Robust – maintenance free design
- Hermetic
- Lecithin from Enzymatic Degumming
  - Highly viscous
  - Installed biggest lecithin drying plant 50tpd with 80% moisture in feed

---

**MEDICINAL GRADE LECITHIN**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone Insoluble</td>
<td>%</td>
<td>60 – 62</td>
</tr>
<tr>
<td>Acid Value</td>
<td></td>
<td>&lt; 30</td>
</tr>
<tr>
<td>Color</td>
<td>Gardner</td>
<td>10 – 11</td>
</tr>
<tr>
<td>Total Plate Count</td>
<td></td>
<td>&lt; 250</td>
</tr>
<tr>
<td>Viscosity</td>
<td>cP</td>
<td>94</td>
</tr>
<tr>
<td>Coliform</td>
<td>cfu/g</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Yeast &amp; Mould</td>
<td>cfu/g</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Salmonella</td>
<td></td>
<td>Absent</td>
</tr>
</tbody>
</table>

Temperature of heating media < 90°C
Hygienic process conditions
ACID OIL PLANT

• Soapstock Splitting
• Right Selection of Acid Resistant Material
• Reuse of Spent Acid:
  – Low pH effluent
  – Reduced Sulphuric Acid Consumption
• Scrubbing of acidic fumes

AUTOMATION

Microprocessor based control:
1. **HMI** – Human Machine Interface
2. **PLC** – Programmable Logic Controllers with **SCADA** – Medium level control – Individual process
3. **DCS** – Distributed Control System – Multiple operations control – Solvent Extraction, Oil Refining, Fat modification, Fatty Acid Plant etc. by one control system
AUTOMATION - Levels

• Level I – Process parameter control
• Level II - Process parameter control and Data Logging
• Level III - Logical Control of operations – Process and utilities flow mass control and data logging, material balancing for evaluating the online manufacturing cost
• Internet of Things (IoT)

ADVANTAGES OF AUTOMATION

• Entire operations in storage and process plant can be controlled through a single central processor, with a facility of localized control points for individual section.
• Optimum selection of field instruments and reliable processors/electronic components as per the required duty conditions --- Mass flowmeters for Steam, VFDs for pumps, high accuracy level, pressure and level transmitters, energy meters etc.
• Analysis of all the process parameters and consequent precise control of operations
ADVANTAGES OF AUTOMATION
- Detail report generation of entire plant parameters and stock can help in making commercial decisions
- Current and Cumulative stocks report generation
- Status of entire operations can be viewed from remote places
- Customized automation solutions
- Economical Automation solutions for small capacity plants (30 TPD and above)

ORGANIC REFINING
- Sourcing: Organic Farms
- Soybean crushing: with extruders & expellers
- Degumming using Water & Organic Reagent
- Bleaching with Neutral Earth
- FFA removal using Steam Distillation
**TECHNICAL AUDITS**

- Process upgradation – new technologies
- Improve efficiency and performance – minimize consumptions & losses
- Capacity Enhancement
- Automation
- Energy Audits
- Environmentally friendly & safety

**CONCLUSION**

- Finished Oil Quality – Oxidation stability
  Flavour reversion – from beany to fishy
  Analysis of Phosphatides, FFA & Peroxides at each stage
- Value addition in By-Products
- **Evaluation of cavitation technology, DVC is working on atomized mixing of reagents in degumming & neutralization with low power consumption.**
- Update the Technology to be compatible with Quality, Yields, Processing cost, Automation, etc.
THANK YOU!

Contact:
DVC Process Technologists
DVC House, Sr.No.111/11/1, Plot No.4
Opp B.U. Bhandari Mercedes Benz Showroom
Mumbai-Bangalore Highway Service Road
Baner, Pune-411045, Maharashtra
INDIA

www.dvcprocesstech.com

Tel: +91 8669956061 - 64
Email: sales@dvcprocesstech.com
info@dvcprocesstech.com