

TECHNOLOGY WITH INNOVATION

**SOYBEAN OIL PROCESSING:
TECHNOLOGY UPDATES**

SOPA INTERNATIONAL
SOY CONCLAVE

10th October 2019

DVC PROCESS TECHNOLOGISTS
www.dvcprocesstech.com

CONSERVE ENERGY, SAVE ENVIRONMENT

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 it's 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.





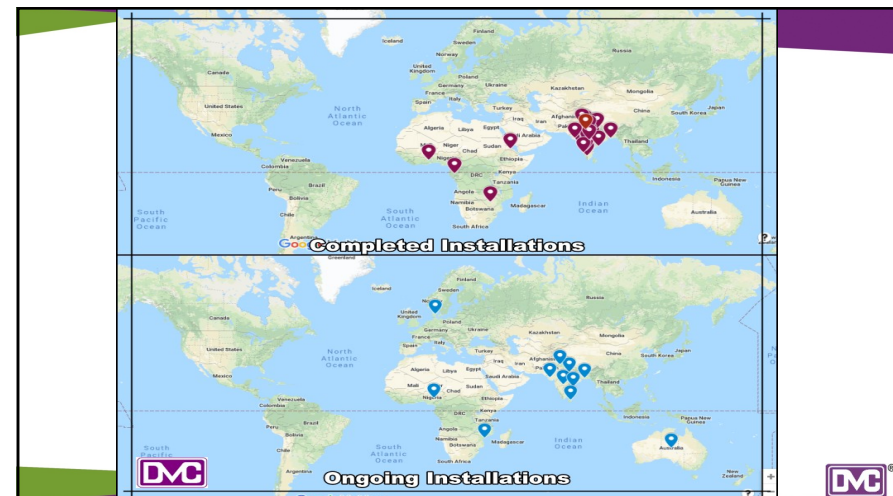
ACHIEVEMENTS

- 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

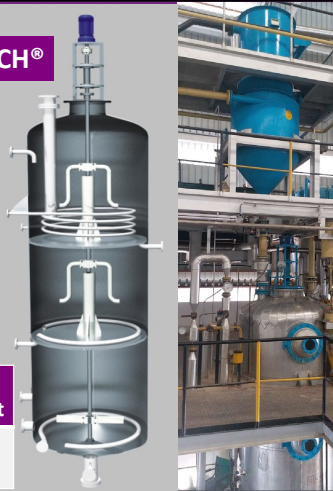
	P content (ppm)	FFA (%)
Crude	500 – 900	0.4 – 1
Water Degummed	120 – 200	0.4 – 0.8
Neutralized & Washed	10 – 15	0.1

BLEACHING

HIBLEACH®

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

P content	Peroxide Value	Fe Content
3 - 5 ppm	< 0.5 mEq/kg	< 0.1 ppm




DEODORIZATION


KOMPOSITE®

- 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


FFA content	Peroxide Value	Taste
< 0.05 %	Nil	Bland



REGV®
Regenerative Vacuum Heat Exchanger



FEVAC®
Vacuum Final Heater



- User Friendly, maintenance free
- Cylindrical design with no restriction on testing pressure

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

LOWTRANS®

Stripping in packed column @ high temp 240 - 250°C

Regenerative cooling to 220 - 230°C

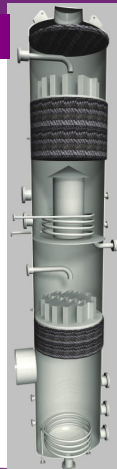
Retention



TWO STAGE SCRUBBING

DUALSCRUB®

- 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

SCR®



MEDICINAL GRADE LECITHIN

Parameter	Unit	Values
Acetone Insoluble	%	60 – 62
Acid Value		< 30
Color	Gardner	10 – 11
Total Plate Count		< 250
Viscosity	cP	94
Coliform	cfu/g	< 10
Yeast & Mould	cfu/g	< 10
Salmonella		Absent

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

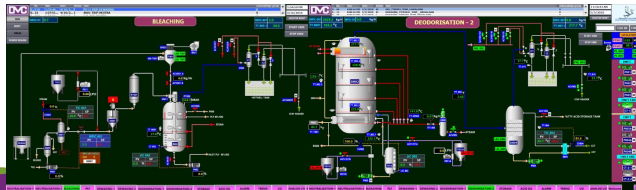
Microprocessor based control:

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!

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Technology With Innovation

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