Fermentation Improvement through Yeast Technology in Distilleries
Presentation Road Map....

- Introduction to ABF Group & AB Mauri
- Indian Alcohol Industry
  - Challenges and objectives
- Yeast & yeast technology
  - Yeast strains, stress factors, application and nutrition
- Fermentation Solutions by AB Mauri
  - Specialty Yeast division and product portfolio
  - ABM value proposition
- Conclusion
- Contact details
Introduction to ABF Group & AB Mauri
ABF Group Facts

Annual Turnover: £12.9 billion

118,000+ employees

Operations in 47 countries
ABF Group Companies

- SUGAR
  - AB Sugar
  - ILLOVO Limited

- AGRICULTURE
  - AB agri

- RETAIL
  - Primark

- GROCERY
  - Silver Spoon
  - Allied Bakeries
  - Jordans
  - ACH Foods
  - Westmill Foods
  - Twinings
  - AB World Foods
  - RYVITA
  - GWF

- INGREDIENTS
  - AB Enzymes
  - AB Ingredients
  - Ohly
  - PGP International
ABF Group Leading brands
Associated British Foods is a diversified international food, ingredients and retail group with sales of £12.9 billion and 118,000 employees in 47 countries.
AB Mauri – an Introduction...

“A product driven business with two major global segments: Yeast & Bakery Ingredients.”

**Yeast:** AB Mauri’s global expertise and technology capabilities in Yeast now encompasses: bakery, bioethanol, alcoholic beverages, pharmaceutical & animal nutrition.

**Bakery Ingredients:** AB Mauri are baking technology leaders with a clear focus on customer outcomes that encompass product characterisation performance, taste and freshness dimensions in baked products for the World’s bakers, both large and small.
Alcohol Industry In India
Current practices in Indian Alcohol Industry

Yeast is essential key ingredient to produce alcohol from any substrate..

**END USE**
- Potable
- Industrial
- Biofuel

**INGREDIENTS**
- Molasses\+ Water + Yeast
- Grains – Broken Rice / Corn / Sorghum / Millet \+ Water + Yeast \+ Enzymes
- Barley Malt + Water + Yeast \+ Enzymes

**OUTPUT**
- RS / ENA / AA
- RS / ENA
- FMS / MMS

**PERFORMANCE INDICATORS**
- Primary – FE ↑, Yield ↑, Fuel Factor↓, Chemicals ↓
- Important – Throughput ↑, Water ↓, Effluent ↓, By-Products ↓
- Desired Flavor Profile ↑
Challenges for Distilleries

Market volatility leading to more emphasis on cost reduction to improve profitability...

External Factors:
- Market – Frequent price variation
- Raw Material – Availability and price variations
- Higher energy cost

Internals Factors:
- **Cost of production**: Proper selection of yeast helps to improve yield and reduce the chemicals cost and energy consumption.
- **Higher productivity**: Higher alcohol titre using proper yeast leads to higher throughput, lower effluent and therefore higher operational efficiency
Objective

Fermentation is area of net profit to a Distillery……..

*What is the ultimate objective for Distilleries in the fermentation process?*

• Higher alcohol yield / higher alcohol titre?
• Greater throughput / faster fermentation?
• Improved sugar : alcohol ratio?
• Higher backset % / operational improvement?
• Maximize / Increase profitability?
• Reduced water / effluent / energy consumption?
• Other?

*AB Mauri wishes to work together in partnership with you to achieve these objectives*
Yeast & yeast technology
How Yeasts behave differently....

Various yeast strains may differ in...

- Temp, pH & sugar and alcohol tolerance
- Organic acid tolerance
- Flavor & fusel oil production
- Flocculation & foam production
- Respiratory growth rate, yield & stability
- Enzyme activity and carbohydrate / sugar utilization pattern
Stress factors on yeast

- Ethanol/CO₂
- Osmostress
- Nutrient starvation
- Cell aging
- Rehydration
- Mechanical shear, hydrostatic pressure
- Temperature shock
- Acid wash/pH shock
Yeast Nutrition

Availability of required quantity of nutrients differ from substrate to substrate and hence supplementation may be needed to get desired performance...

Nutrients supplied by substrates to yeast do:

• Aid fermentation
• Aid yeast growth & reduce yeast stresses
• Ensure desired fermentation rate
• Ensure consistent yields & efficiency
• But differ in useable quantity

Major nutritional supplementation include:

• Nitrogen: Urea (if allowed), Ammonia, DAP
• Phosphorus: DAP
• Metal ions: MgSO4, ZnSO4

*Nutrient dosing would differ plant to plant and it can be provided/verified.
Yeast Application

For effective running of plant (consistency, control & efficiency), yeast need to be applied with following properties at correct time into the fermenter:

- Adequate number / ml
- High viability:
  - Viability is a Yes or No question “Whether yeast is alive or dead?”
- High vitality:
  - Vitality indicates health or activity of a yeast and it is a product of metabolic activity and growth potential of a yeast cell or culture.
- Low contamination
Specialty Yeast vs Self-propagation

True yeast propagation require:
- Pure yeast inoculum – its maintenance
- Very low carbohydrates
- Very high oxygen – Accuracy, sterilization
- Specialized equipment and expertise

Advantages:
- Less contamination issues that can arise with propagation
  - And hence less cleaning & labour costs.
- Maximizing substrate usage
  - Substrate used to make alcohol, not yeast.
- Consistency of fermentation
  - Less fluctuation in yield/performance.
- Reduced skilled labour input/requirement.
- Hidden cost of propagation
- Reduced requirement of QA/QC laboratory measures.
- Ease of handling.

Propagation Cost:
- CIP – steam, chemicals, pumping ... Hidden cost
- More chances of contamination in an alcohol plant – inconsistent performance
Fermentation Solutions by AB Mauri
AB Mauri’s Yeast & Yeast Technology

Products:
• Yeast Strains
  – Developed strains for specific purposes
• Yeast Manufacturing
  – Stringent conditions with quality assurance

Technology:
• Process control at distilleries
  – Lower by-product formation / maximizing yield
• Optimization of operational parameters
• Nutrition supplementation based on substrate quality
  – Optimal nutrient dosing

Expected results from AB Mauri’s Specialty Yeast
✓ Improved propagation stability
✓ Improved and more stable micro biology in fermentation
✓ Lower residual sugars, which implies higher alcohol yields
✓ Lower levels of organic acid and glycerol which implies higher yields
AB Mauri India - Specialty Yeast Division

• Alcohol
  Spirits:
  ▪ Molasses fermentation : Fali-M
  ▪ Grain fermentation : Fali
  ▪ Malt fermentation : Pinnacle

Wine
Beer & Cider

• Pharma
• Animal Nutrition
• Food
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<td>• Specially developed yeast strain for cane <strong>molasses</strong> fermentation</td>
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<td>• Osmo-tolerant</td>
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<td>• Thermo-tolerant</td>
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<td>• High gravity fermentation</td>
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ABM Value proposition

Valued Customer

- Supply chain excellence
- Product Innovation
- Consistent quality and competitive pricing
- Technical and analytical
- Trouble shooting
- Regulatory
- Application (product & process)
- Global know how and presence
It is yeast that converts sugar into alcohol and makes your yield.

Effective yeast management and yeast strategy will enhance profits.

Yeast is a minor cost (less than 1%) but can influence overall cost of production to a great extent.

Yeast management is a specialized job and better left to the specialists.

AB Mauri has yeast technology and expertise to assist you in achieving overall objectives.
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AB Mauri

Global Expertise, Local Knowledge