Catalysts

CONNECT

Volume-38 Issue No. 1

www.thecatalystsgroup.com

/thecatalystsgroup

Table of **Contents**

MD's Desk

Munish Madaan
MANAGING DIRECTOR

Hello Friends!

Wishing you all a very Happy New Year 2023. May this new year bring abundance of health, happiness and prosperity for all of us.

On the 6th of January, 2023, we as Catalysts celebrated our 20th Anniversary. Heartiest congratulations to all my team mates at Catalysts on this special occasion. It is an amazing feeling to have completed two decades of continuous growth and be a part of a team which has worked relentlessly to make Catalysts as India's No. 1 and most trusted Biotech Company for Distillery and Sugar industries. My deepest gratitude to our Clients, Principal partners and Vendors for their continued trust on us.

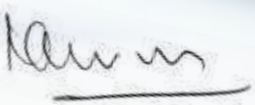
In 2022, economies all across the globe struggled to deal with challenges like high energy costs due to the Ukraine-Russia war and hyperinflation. However, the Indian economy with its resilient markets and expected GDP growth of around 7% in this FY has continued to remain the fastest growing big economy of the world.

India has emerged as the world's largest producer and 2nd largest exporter of Sugar even after diverting substantial quantities towards Ethanol Production. It has surpassed its target of achieving 10% ethanol blending in petrol and huge capacities are being added in Grain and Sugarcane/Molasses based distilleries to achieve 20% blending targets by 2025. India is set to have enough capacity to produce required Ethanol to achieve this target. However, some challenges like availability of enough compliant vehicles to consume 20% blended petrol and required raw material availability for Ethanol Production from Grain, still need to be addressed.

In the first three quarters of the ongoing financial year, revenues of Catalysts Group have grown by around 60%. We have maintained our leadership position in providing solutions to both Grain and Cane Syrup/Molasses based distilleries Pan India for maximising their yields and productivity. We have also expanded our global outreach, today we have established a significant footprint with our products and solutions in over 18 countries. I am sure with our collective hard work and determination we will make 2023 even better and lay a strong foundation to achieve our vision of becoming a 1000+ cr enterprise by 2026.

Congratulations once again to all my colleagues and associates in Catalysts on completing 20 glorious years of performance and growth in providing unmatched products and services, creating immense value for our customers and maximising impact in the industries being catered.

All the Best for 2023!!



Munish Madaan

Our Vision

A globally acclaimed company creating value for all stakeholders by providing innovative & sustainable solutions

Our Values

- **C** Customer Oriented
- **A** Adaptability
- **T** Team-work
- **A** Ambitious
- **L** Learning Attitude
- **Y** Yes to Life
- **S** System Driven
- **T** Taking Initiatives
- **S** Self-discipline & Integrity

India's

No. 1 and Most Trusted

company in Sugar, Distilling and Brewing industries

We are

- Customized Products & Solutions provider in biotech space
- Offering a wide range of enzyme-based eco-friendly solutions
- Catering to various industry verticals across the globe

We have

- Provided customized enzyme-based solutions of worth >1500 crores ₹
- Saved losses and created benefits
  - Of >6000 crores ₹
  - To 700+ clients in 18+ countries
- Facilitated our clients to generate additional average profit of ~2 to 20 crores ₹

Our Industry Verticals

- Sugarcane Processing
- Distilling – Cane Syrup / Molasses
- Distilling – Grain
- Malt & Brewing
  - Malt Extraction
  - Industrial Brewing
  - Craft Brewing

Maximizing clients' profitability through innovative Products & Solutions since 20+ yrs.

State-of-the-art DSIR accredited lab

Technically qualified Customer Support Team

Quality certified (FSSC 22000, Halal, Kosher) formulation facility

Channel partnership with world's top companies

Our Expertise

Customer Centric Approach

Technically qualified Application Scientists addressing customer challenges with sophisticated portable instruments

- **Lab-scale** application support
- **Lab to Plant level** scale-up
- **On-site** process **support**
- **Data mining** and troubleshooting
- Process and Product **Optimization**

Research & Development

Team comprises of 18 experienced Scientists and Industry Experts

- State-of-the-art R&D Lab
  - **DSIR (Govt. of India) recognised in-house R&D center**
- Well-defined process for developing & launching customizable solutions
  - Detailed raw material analysis by process experts
- Well-equipped QA & QC laboratories

Catalysts' **Excellent 20 Years**

journey continues...

2022

Crossed 200 Cr. ₹ sales turnover

2021

State-of-the-art Technical Centre at Sahibabad (U.P.)

2020

Established Manufacturing unit in NCR region and upgraded Production Facility

2019

Corporate office at Delhi

Crossed 100 Cr. ₹ revenue

2018

DSIR Recognition for Research Facility & NABL Accreditation for Application Laboratory

2016

Foray into International market with 30% YoY growth

2013

Achieved 50 Cr. ₹ revenue

Expansion in South India (Hyderabad)

2009

Brewing & Malt vertical started

Expansion in Central & West India (Pune)

2011

Channel partnership with Novozymes

2008

Manufacturing unit started & received ISO 9001:2015, Food Safety & Halal certifications

State-of-the-art Biotech Research Lab established

2007

Became biggest channel partner for Biocon for Industrial Enzymes in India

2003

Started as Biocon's distributor in North India

Beer Tour

Deepti Verma, Executive, Associate Research Scientist - R&D

"He was a wise man who invented Beer" - **Pluto**

Indeed! Because how else were we to wind up a long day at work or have a good time at parties?

One of the oldest and most popular drink of human history, Beer known for a combination of unique flavour, frothy texture, and pungent aroma. Do you know where these flavours and aromas come from? They come from a combination of hops, malt, and yeast strains and are achieved through a multi-step process, commonly known as Brewing.

The history of chemically produced beer, the one we drink today, can be traced back to the 5th millennium BC in modern Iran. Soon, it found its way across the world and evolved over the years but the basics of brewing remain the same to date.

Nowadays the whole world is producing various beers on large or small scales, canned or fresh beer, with different flavours. Until the beer reaches your glass it goes through a number of stages? The well-accepted source or shall we say that "the soul" of beer is malted barley. It contains starch, protein, and many ingredients that act as a good feed for yeast when converted into a simpler form of fermentable sugars. The yeast uses these fermentable sugars and converts them into flavourful beer that we love. As mentioned above, the entire process undergoes several steps to bring out the richness of flavours & aromas. So, here's the description of a brief process of how your Beer is brewed before getting hold of that pint of beer again.

Beer fermentation is a well-known process and involves several successive steps to come to the final product. It involves malting, milling, mashing, lautering, hop addition and wort boiling, whirlpool, wort cooling & aeration, and fermentation. Don't be so excited, your beer is not ready yet before it comes to your glass it still has to pass a few more stages like removal of yeast, maturation or aging, filtration, and packaging. Each step is critical to the production of quality beer.

The first step in this process is **Malting**: in this process, barley is steeped with water, so it undergoes germination. This process is held for 2-3 days during which the indigenous enzymes of barley are

activated. These enzymes convert the starch molecules into fermentable sugars in further stages. Once the enzyme molecules are activated, germination is halted by the kilning process, i.e., the malted barley is roasted to a higher temperature.

The next step is **milling**, where malted grain is crushed to prepare the ideal grist by reducing the kernel size and exposing starchy endosperm without much damage to the husk. The starch molecules in the endosperm are locked in protein and carbohydrate complexes. The crushing of grain in coarse particles increases the surface area and availability of these molecules to enzymes.

Once the milling is done, it undergoes the most interesting phase called as **mashing**; This process can be termed as the 'Heart of brewing'. This is done by mixing grist with hot water to convert the insoluble starch and protein molecules by enzymes. This enzyme activity is temperature and pH-dependent, therefore the whole process is done at successive temperature profiling. The major enzymes that work in beer fermentation are Beta Glucanase, Amylases, Proteases, and peptidases. All these enzymes best act at their optimum temperature and pH. Beta Glucanases act as a disbranching enzyme and best work at 40-45^{o}C. This helps in the breakdown of Beta- glucan and releases the starch and protein molecules in cross-linking. Proteases convert large protein molecules to peptides and then less complex nitrogenous compounds. The peptidase enzyme converts these peptides into free amino acids. These converted molecules help yeast in their metabolism during fermentation and produce the desired compounds to produce a quality beer.

The next stage in beer production is **Lautering**, where the mash or spent grain is separated from a sugary liquid called as wort. Once the sweet wort is separated, the mash bed is sparged with hot water to extract the excess sugar present in the mash.

Now is the time to give the beer some flavour and aromas, the wort is heated to boiling temperature with the addition of hops, which gives the beer a bitter taste. **Wort boiling** has many significant advantages like inactivation of enzymes, sterilization of wort, isomerization of hops alpha acids, evaporation of volatile acids, and precipitation of proteins.

Next up, we clarify the wort from hops, precipitated protein and other unwanted particulate matter also called hot trub, and the process is named **Whirlpool**. Once the clear wort is obtained then it passes through plate heat exchange (PHE) and then the **cooled wort** is oxygenated and ready for fermentation.

Once the fermentation wort is ready the yeast pitching is done either in the form of dry yeast or culture. Yeast metabolizes the fermentable sugar released during the mashing process and converts it to ethyl alcohol. The whole process takes 7-14 days at 12-25^{o}C depending upon the type of beer or type of yeast used (Ale or Lager). This is called **beer fermentation**.

You must be thinking, this is it. But there is still some time for the beer to be ready. It is time for Maturation.

The fermentation broth is a mixture of unmatured beer and yeast, so now our next step is to remove yeast from your beer. Then, this green beer is transferred to a **maturation** tank where stabilization of beer flavours, microbial stabilization, and physical stabilization happens. Carbonation is also done to decrease the chances of flavour changes due to oxidation. Carbonation is also done to decrease the chances of flavour changes due to oxidation. Maturation is done between 0-4^{o}C for 4-7 days.

The matured beer is now entering in its final stage called as filtration, done to clarify the final product by removing the haze particles. Once the whole process is completed your beer is ready to be bottled and enjoyed.

Cheers!!

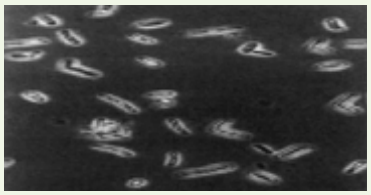
Healthy Yeast

Bhoopendra Bhardwaj,
Associate Research Scientist - R&D

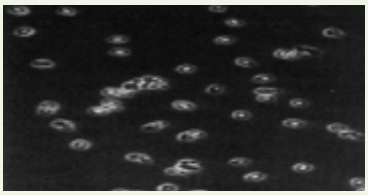
We know Yeast plays a crucial role in fermentation, it could be said that Yeast is HEART of fermentation. If the Heart is healthy, the fermentation process runs smooth. So, we must take care of Yeast to have better fermentation efficiencies.

Impact of yeast health on fermentation
Healthy yeast accelerates the rate of reaction and supports the fermentation process by overcoming the following challenges.

- Decreased fermentation efficiency
- Higher by-product formation
- High bacterial growth



Stressed Yeast



Healthy Yeast

How to maintain Yeast health??

Maintaining Yeast health is the most important factor during fermentation and the following will provide a favourable environment for yeast.

1. Maintaining proper Sugar & Nutrient concentration during fermentation

Yeast can convert sugars into ethanol, but when the sugar concentration is high, it will suppress the yeast performance. In the hypertonic solution (High sugar) yeast cell size will be reduced and yeast is forced to produce more glycerol to protect it from the osmotic pressure.

Apart from sugars, Nutrients also play important role in better yeast growth. Commonly distillers will be using Urea, Zinc sulphate & Magnesium sulphate etc. during fermentation. Apart from these, yeast also requires various other macronutrients, micronutrients & vitamins which are critical for yeast growth. Some of these important nutrients were listed in

table1 along with their role in yeast growth.

Table 1: Yeast nutrients and their role in yeast growth

Sr. No.	Nutrient	Role in yeast Growth
1	KH2PO4	Improved glucose assimilation and maintain ionic equilibrium in cell
2	K2HPO4	Essential cofactor for many enzymes and synthesis of ribonucleic acids
3	(Nh4) 2SO4	Improve biomass & EtOH production rate
4	MgSO4	Cofactor, Cell division, maintains tertiary structure of proteins and structural integrity during stress conditions
5	FeSO4	Key in amino acid, deoxyribonucleotide and lipid synthesis. Involved in regulation of general stress responses
6	MnSO4	Essential cofactor, stimulates the synthesis of proteins and fermentation
7	NH4Cl	Maximises growth rate and Increase glucose consumption rate
8	K2SO4	Increases thermotolerance
9	ZnSO4	Co factor for alcohol dehydrogenase (ADH) enzyme and is the activator that drives the final reaction involved in ethanol fermentation
10	CuSO4	Sssential micronutrient for yeast respiratory pigments
11	MoS2	Nitrate Metabolism & Vitamin B12
12	NiSO4	Urease activity

2. Inhibiting other microbes from the race of fermentation

Microorganisms are the major competitors of yeast during fermentation. The microbes like Acetobacter, Lactobacillus & Bacillus are the most common contaminants that compete with yeast during fermentation. These microbes can utilize the sugar and produce by-products like Acetic acid, lactic acid etc. So, we must inhibit these microbes to provide better growth environment for yeast. using some antimicrobial compound. The lesser the microbial contamination better it is for the yeast fermentation. The selection of antimicrobial compound is a key factor, and it has to be selected in such a way that it won't impact yeast metabolism.

Proper hygiene and environmental conditions to be maintained at distilleries by cleaning Fermenters, Pre-fermenters & yeast Vessel sections, Lines and PHE at regular intervals for better control of contamination.

3. Providing enzyme boosters

Apart from Nutrient & Antimicrobial compounds, Enzymes are vital to improve yeast metabolism. These Enzymes aids in yeast productivity by supplying essential nutrients, breakdown of complex polymers to simpler forms and driving the yeast metabolic pathways towards alcohol production that cannot be performed by yeast independently. Some of the common enzymes with their role in fermentation are cited in table 2.

Table 2: Enzymes and their role in fermentation

Sr. No.	Item Name	Action point
1	Acid Protease	Hydrolyses proteins to peptides and/or amino acids
2	Neutral Protease	Hydrolyses the protein matrices to release "hard" to hydrolyse starch
3	Papain	Enzymatic hydrolysis of proteins and peptides to Increase FAAN content
4	Phytase	Converts an unusable organic form of phosphorus, phytic acid, to a usable form of inorganic phosphorus

As in human, Healthy heart is important for healthy life, similarly healthy Yeast is important for the smooth Fermentation. So, taking care of the fermentation's heart, will yield better results and revenues for the industry.

We at Catalysts biotechnologies Pvt. Ltd. have a DSIR approved in house R&D centre with state of art Research laboratory developing/developed many products/solutions, that can address the challenges faced by the industry including the aspects of taking care of yeast health. Catalysts provides active dry yeast (ADY) that is superior with to culture yeast and addresses the challenge of having expertise to maintain the yeast cultures and contamination related operational challenges.

Mass Balance

Law of Conservation of Mass in Alcohol Fermentation

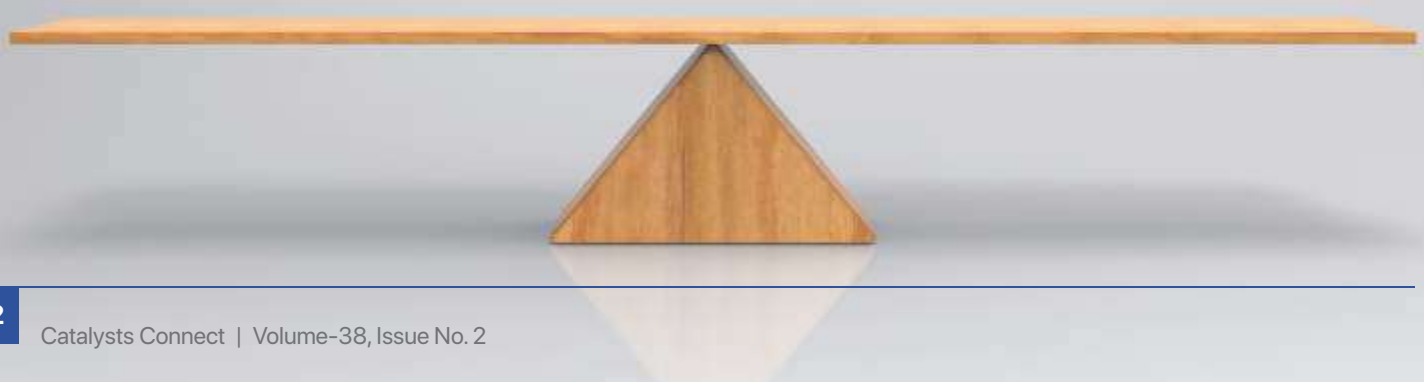
Anil Rai, Senior Research Scientist - R&D

Did You Know?

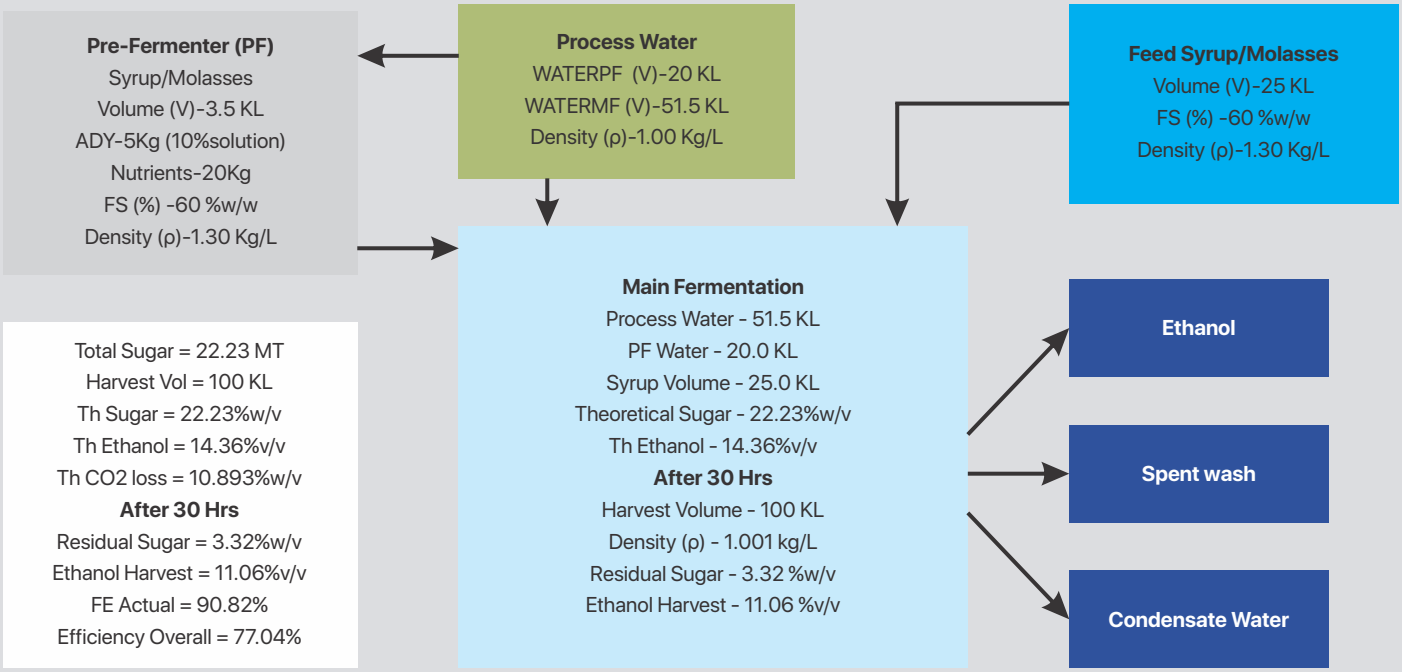
The concept, where "mass" neither be created, nor destroyed but can changed from one form to another form in an isolated closed system. Reactions involved with conversion of mass into energy (nuclear reaction), is an exception. Mass is an intrinsic value of matter, whereas weight, volume and density are extrinsic property of matter, these can vary with external condition like Temperature, gravitational field etc.

Here we will try to find out why mass balance is generally preferred over volume balance.

Total Mass of Reactants = **Total Mass of Product Formed**



Let's Learn with the Example



$$FEED_{vol} + WATER_{vol} + Yeast_1 + Nutrients$$

Volume Balance 28.5 KL 71.5 KL (100.00KL)

Mass Balance 37.05 MT 71.5 MT 5 KG 15 Kg (108.57MT)

$$MF_{vol} + Yeast_2 + CO2_{loss}$$

Density x Volume = Weight

Mass Balance 100.1 MT ~~(-15Kg)~~ (8.47 MT)

CO_2 → Equivalent EtOH weight loss Weight

Volume Balance 100 KL

Observing gravity fall indicates some mass is getting lost from the system, but for calculating quantitatively, this mass balance will be useful. In comparative studies, since Mass is intrinsic properties nature, impact of temperature variation in data is not there. (That's why it preferred)

Syrup Volume | **Syrup Weight** | **Sugar Weight** | **Sugar Conc** | **Residual Sugar** | **TH Ethanol** | **Achieved Ethanol** | **Overall Efficiency**

$$\text{Theoretical Syrup} = \frac{\text{Vol} \times \text{Density} \times \text{Fermentable Sugar} \times 0.644}{\text{Volume MF}}$$ EtOH

$$\text{Efficiency (\%)} = \frac{\text{Achieved EtOH} \times 100}{\text{Th EtOH}}$$

QMS Implementation

Joole Chauhan,
Research Associate – R&D

A quality management system's definition (QMS)

A QMS is a system for controlling a product's or a process' quality. In addition, a QMS is a system for recording the organisation, protocols, roles, and procedures necessary for efficient quality management. The QMS describes how a company will create, record, manage, and deliver a goods or services that has value in the eyes of the consumer.

How to Put a Quality Management System into Practice

An efficient QMS will need to be implemented, which will cost time and money. Here is a list of a few crucial points to remember when putting a QMS into place.

Support of Top Management

For a QMS implementation to be effective, senior management support is critical. An organization's management team must be committed to the QMS's success. Here are a few examples:

- **Business Analysis:** The management team should examine their organisational structure and identify the main areas where a QMS should be implemented. The important regions should be chosen based on the needs of the customers.

- **Initial Planning:** By identifying the resources needed, putting together the teams, and developing an implementation strategy, management should be actively involved in the planning phases.

Boost Awareness & Offer Professional Training

To inform all staff about the future QMS, organise instructional workshops. Before being introduced, any new procedure, management system, or product must undergo thorough training.

Documents and Document control

Correct documentation is the cornerstone of an efficient quality management system. Documentation must be produced to assist the system's deployment, control, education, and implementation activities. Like: Standards, guidelines, a quality guide, instruction manuals, training materials, audit forms, process diagrams, and control plans.

Deployment

Deployment the implementation plan created during the planning phase should be followed during QMS deployment. Describe the current status and document each process.

Control and measurement

In order to maintain the manufacturing of high-quality products, it is necessary to govern the various organisational processes and measure and monitor the key process and product characteristics.

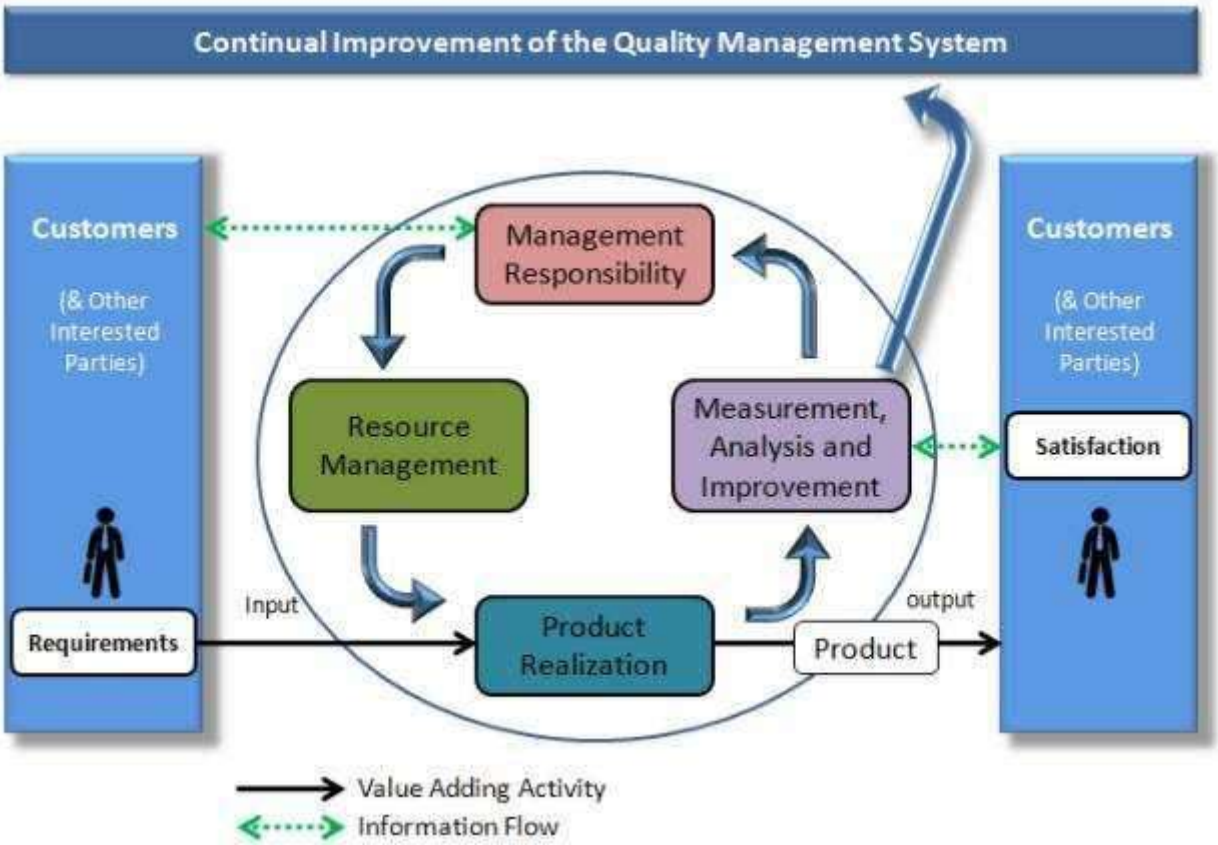
Audit & Maintain

To ensure that each department, area, and procedure is audited on a regular basis.

Internal audits significantly improve the quality management process when they are well-planned, implemented, and maintained.

Continuous Learning and Improvement

The capacity to apply lessons learned from one department or process to enhance similar processes across the organisation is a crucial benefit of establishing a QMS. The organisation will experience significant improvements in quality, safety, efficiency, and productivity even if only incremental, continual changes are made to work standards and processes. In the end, this has a favourable effect on the bottom line. While some firms accept continuous improvement as a mentality, others see it as an activity.



Second Generation Bioethanol

An alternative for making Earth Green

Prerna Srivastava,
Research Associate – R&D

Concerns about the world's rising energy needs and climate change have boosted academic and industrial investment in the creation of sustainable and environmentally friendly technology to produce biofuels and bio-based chemicals. In addition to being expensive and producing less of them while demand is rising, the usage of fossil fuels made from petroleum is one of the main causes of environmental damage. Efforts are made to increase the use of biofuels like bioethanol to lessen reliance on fossil fuels, help the world meet its future energy needs, and achieve the Kyoto Protocol's targets for reducing carbon dioxide emissions. As a result, it is anticipated that by 2050, 30% of the world's fuel needs would be met by biofuels.

First- and second-generation bioethanol

First generation bioethanol is the name given to the bioethanol produced from corn, sugar cane, and sorghum which act as raw material. The viability of producing first-generation biofuels is in doubt because of the associated conflicts including ethical issues and high cost as it meets the needs of food market as well. Sugarcane juice and molasses, which are the by-products of the sugar industry, are consumed in 1G bioethanol production, whereas surplus biomass and agricultural waste are used in 2G plants to make bioethanol.

Due to the above-mentioned issues, second generation fuels come into existence which use lignocellulose biomass found in agricultural and industrial wastes to produce bioethanol. By utilizing potential polluting wastes from industries and providing a cost-effective solution, 2G fuel is considered as the most promising alternative to replace non-renewable fossil fuels.

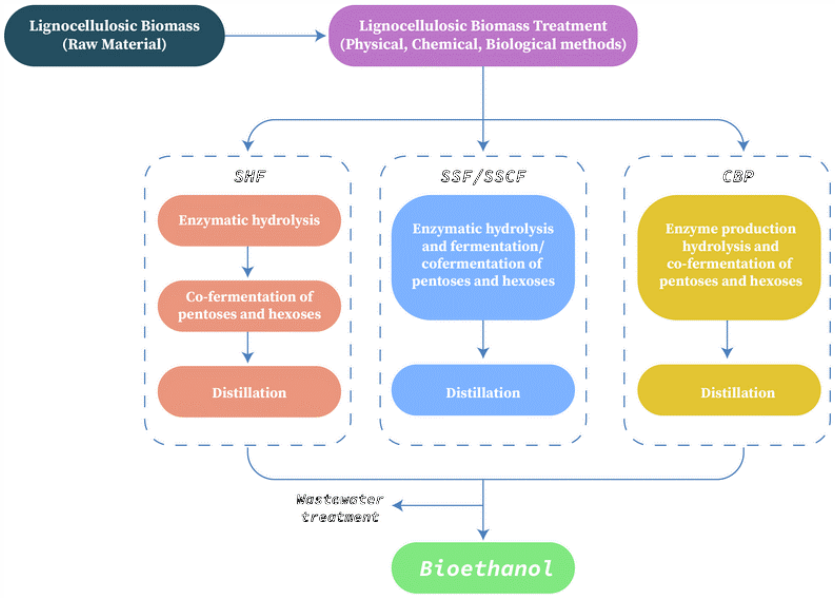


Figure: Procedures for producing second-generation bioethanol. A bioreactor is depicted by each box. Chemical hydrolysis is used as part of the pre-treatment. Consolidated bioprocess (CBP), Simultaneous saccharification- fermentation (SSF), Simultaneous saccharification- co-fermentation (SSCF), Sequential hydrolysis and fermentation (SHF), Sequential hydrolysis and cofermentation (SHCF).

Challenge with 2G bioethanol is the lack of natural ability of Saccharomyces cerevisiae to utilise pentose. To combat this challenge, researchers are working on techniques like co-culturing of yeast strains and modification/combination of sugarcane molasses and bagasse hydrolysate. A study reported that co-culture fermentation with wild-type strains of S. cerevisiae and S. passalidarum produces the most ethanol and accelerated the synthesis of bioethanol from lignocellulosic biomass.

Second generation bioethanol: It's time to take off immediately for India

India's goal of mixing 20% ethanol into gasoline (E20) by 2025 can be crucial in lowering crude oil imports and boosting the country's energy independence. At present, India mixes 8.5 percent ethanol with gasoline. To reach its E20 goal, the nation has been supporting 2G bioethanol. It can aid in achieving the goal of transforming trash into energy as well as minimising the incineration of agricultural waste which is dependent on the 2G facility. Searching for the alternative energy sources like second generation bioethanol could be a viable solution to reduce the fossil fuel consumption. Second generation (2G) bioethanol, which is made from the lignocellulosic fractions of sugar cane, has a good market potential as an automotive fuel and the procedure is currently being researched on a pilot/demonstration scale. If the conversion of the entire sugar cane is considered, advances in plant design can cut production costs, resulting in higher profitability and competitiveness.

References

1. Farias, Daniele, and Francisco Maugeri Filho. "Co-culture strategy for improved 2G bioethanol production using a mixture of sugarcane molasses and bagasse hydrolysate as substrate." Biochemical engineering journal 147 (2019): 29-38.
2. https://www.downtoearth.org.in/blog/energy/second-generation-bioethanol-it-is-time-to-launch-it-headlong-78507
3. Lugani, Yogita, et al. "Recent advances in bioethanol production from lignocelluloses: a comprehensive review with a focus on enzyme engineering and designer biocatalysts." Biofuel Research Journal 7.4 (2020): 1267-1295.

Significance of RI Detector
with HPLC for sugar analysis

Dr. Pooja Mishra, Research Associate - R&D

The detector is the part of HPLC system that converts a physical or chemical characteristic into measurable signal that corresponds to concentration or identity. There are four different ways that detectors of HPLC might make use of a physical or chemical characteristics either of the solute or mobile phase during chromatographic process[1].

1. A bulk property
2. Analyte specific properties
3. Mobile phase modification
4. Hyphenated techniques

Bulk property detectors are the most versatile detectors for HPLC as they measure properties common to all analytes by measuring differences in the mobile phases with and without the sample. One of the most common bulk property detectors is the refractive index detection (RID). Given the universal nature of bulk property detectors, they responsive to all analytes and place more emphasis on the selectivity of chromatographic column. Detectors of analyte-specific properties react to a feature that is specific to analyte[2].

Factors to be considered while selecting the detector for analysis[2]-

Sensitive, reproducible and predictable response
Responsive to all solutes, or with predictable specificity

- Large linear dynamic range: Response that increases linearly with the amount of solute
- Response unaffected by changes in mobile phase, temperature and flow rate
- Mobile phase independent response
- Does not contribute to extra-column band broadening
- Reliable and easy to use
- Non-destructive of the solute
- Provide qualitative and quantitative information on the detected peak

Working and Importance of Refractive Index Detector (RID)

The refractive index (RI) detector is a universal bulk property detector and are oldest and original LC detector. RI detectors measure the difference in

optical refractive index between mobile phase and the analyte. Solute molecule does not require chromophore. For this reason, RI detection is very commonly used for the analysis of sugars, triglycerides, alcohols organic as well volatile acids[3, 4] **(Fig 2)**. The most common RI detector design is the polarizing refractometer, where the light from a tungsten source lamp passes through a pair of wedge-shaped flow cells, (reference and sample). The reference cell contains trapped mobile phase or static mobile phase, and the column effluent is passes through the sample cell. As light passes through two detector cells, it is refracted differently. This is measured by a pair of photodiodes that convert the

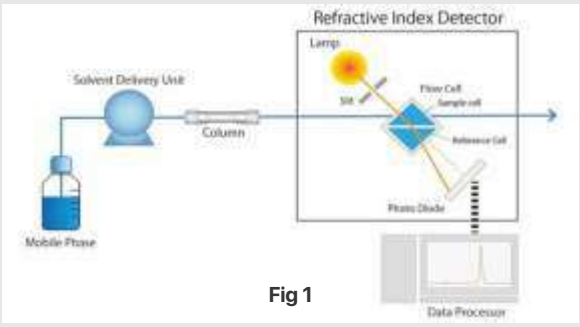


Fig 1

Advantages

- Ease of analysis
- Inexpensive equipment
- Universal detector
- Low-cost reagents compared to other chromatographic technique.

Disadvantages

- Limited sensitivity
- Highly temperature dependent

The HPLC coupled with an ultraviolet-visible (UV-VIS) detector diode- array detector (DAD), an evaporative light scattering detector (ELSD), charged aerosol detector (CAD) can measure only some sugars sensitively and quantitatively. Specific UV detection is unreliable or even impossible due to the lack of chromophores in sugars and sugar alcohol. Therefore, the sugar analysis described above was performed on molasses and grain samples using RID detector (Fig2). The most common method of interpreting sugar is liquid chromatography (HPLC) using refractive index (RI) detector is due its simplicity of analysis cost, low costs of equipment and reagents

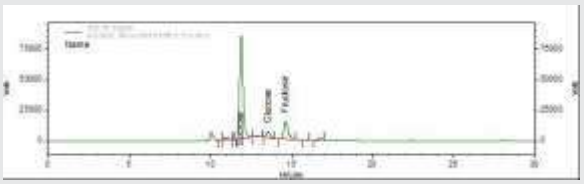


Fig 2 (a)

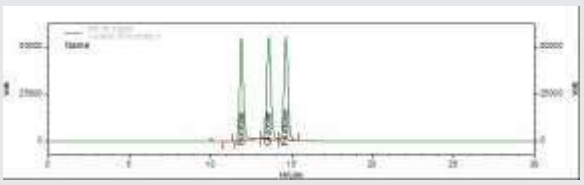


Fig 2 (b)

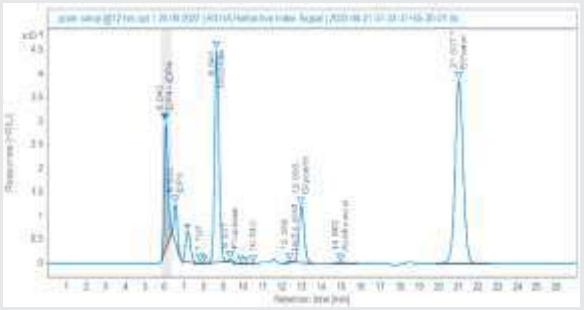


Fig 2 (c)

Figure-2

(a) Standard chromatogram of sugars

(b) Sugars in molasses

© Sugars and volatile acids in grain sample using RID with HPLC

References-

1. Skoog, H and Nieman, "Principles of Instrumental Analysis", 5th edition, Harcourt Publishes Int Company, Chapter 28, p.726-766.
2. Scott, R.P.W. Chromatographic Detectors. Design, Function and Operation, Marcel Dekker: New York, 1996, 72, p 325-330
3. Ouchemoukh, S.; Schweitzer, P.; Bey, M.B.; Djoudad-Kadji, H.; Louaileche, H. HPLC sugar profiles of Algerian honeys. Food Chemistry 2010, 121, 561–568.
4. Singh, J., Singh, R.D., Anwar, S.I. and Solomon, S. Alternative Sweeteners Production from Sugarcane in India: Lump Sugar (Jaggery). Sugar Technology, 201113(4):366–371

Behavioural Skill Development

Impact on Organizational Success

Girish Kumar Khatri,
Assistant General Manager
Human Resource

What are Behavioural Skills?

These skills refer to an individual's ability concerning the characteristics of a particular situation they may come up against. This type of ability can be organizational like when a person reacts to the quality of their work, or when they react to other individuals and establish a relationship, it can even be in the emotional or psychological sector.

Now, the skill-based approach centre's the learning mechanism regarding the skills which are required in a specific context.

What is Behavioural Skill Training?

It is the development of skills that focuses on the following domains:

- Good Communication
- Interpersonal Relations
- Engaging Attitudes

These three things allow the person to work better with the other employees. It is also responsible for developing certain leadership skills. It helps the person to analyse their current behaviour and according to

How does It Impact on Organizational Success?

Now, behavioural skills are important due to the dynamics which occur between individuals and groups in the organization. They impact the organizational success in the following ways:

- It helps the person to create a comfortable work environment.
- These skills also help a person to nurture a culture based on Trust.
- The person can have a more effective communication with the help of behavioural skills.
- It helps an individual create a performance and success oriented hierarchical structure.

Now, a good organizational behaviour can help to enhance the individual's performance and increase the job

Azeotropic and Extractive Distillation

Pardha Saradhi, Regional Manager (South) – Business Development

Distillation is the process of separating the components from a liquid mixture by means of boiling and condensation.

AZEOTROPIC DISTILLATION:

In the distillation of mixture of liquids, the liquid can be heated to convert them to gaseous state. Since they have different boiling points, they condense back at different rate and can easily separate. Some of the mixtures exhibit the same concentration in the vapor phase and the liquid phase. They are called as azeotropes.

MECHANISM OF AZEOTROPIC DISTILLATION:

Azeotropic mixture cannot be separated by normal distillation method. Therefore, addition of a foreign substance which is called as entrainer decreases the boiling point of azeotropic solution and separates the components of mixture at different boiling points.

Example of azeotropic distillation is separation of ethanol with water from its aqueous solution. The boiling point of water is 100 °C and boiling point of ethanol is 78.3°C. By addition of benzene to the azeotropic mixture as entrainer, ethanol can be separated out from the solution.

Benzene breaks the mixture of water and ethanol and forms a new azeotrope between benzene and ethanol. The volatility of water (more polar liquid) is enhanced. On distillation, water distils at 65.85℃ leaving alcohol and benzene behind. The boiling point of this binary mixture is 68.2˚C and benzene gets distilled leaving pure alcohol behind. It can be distilled off at 78.3℃. The benzene can be recycled. Thus, using fractional distillation method, absolute alcohol can be prepared.

TYPES OF AZEOTROPIC DISTILLATION:

1. Heterogeneous Azeotropic Distillation:

The heterogeneous azeotrope contains the vapor phase with two liquid phases. Some common examples of heterogeneous azeotropic mixtures are benzene with water, butanol with water and dichloromethane with water. In the heterogeneous azeotropic distillation, the liquid phase of the mixture is immiscible.

2. Homogeneous Azeotropic Distillation:

In the homogenous azeotrope the constituents of the mixture are completely miscible with each other. In homogeneous azeotropic distillation method, entrainer may or not form additional azeotropes after addition. This distillation process is carried out in a sequence of columns. The azeotropic mixture of A and B forms azeotropic mixture with minimum boiling point. Here both the components must belong to the same distillation region. Now fresh feed is mixed with entrainer and distilled over. The A component is taken as bottom product in 1st column whereas B is taken as top product in 2nd column. Entrainer (E) is recovered as bottom product in 2nd column 2 and recycled to 1st column.

Application: It is used for separation of ethanol and water using benzene as an entrainer. This process is known as dehydration of ethanol. Separation of isobutanol and water. Separation of benzene and cyclohexane.

EXTRACTIVE DISTILLATION:

It is defined as distillation in the presence of a miscible, high-boiling, relatively non-volatile component, the solvent that forms no azeotrope with the other components in the mixture. The method is used for mixtures having a low value of relative volatility, nearing unity. Such mixtures cannot be separated by simple distillation, because the volatility of the two components in the mixture is nearly the same, causing them to evaporate at nearly the same temperature at a similar rate, making normal distillation impractical.

MECHANISM OF EXTRACTIVE DISTILLATION:

The method of extractive distillation uses a separation solvent, which is generally non- volatile, has a high boiling point and is miscible with the mixture, but doesn't form an azeotropic mixture. The solvent interacts differently with the components of the mixture thereby causing their relative volatilities to change. This enables the new three-part mixture to be separated by normal distillation. The original component with the greatest volatility separates out as the top product. The bottom product consists of a mixture of the solvent and the other component, which can again be separated easily because the solvent does not form an azeotrope with it. The bottom product can be separated by any of the methods available.

Application: It is widely used for separation of butadiene from a mixture of butane, butene and small quantities of other unsaturated hydrocarbons.

Separation of benzene from the mixture of benzene-cyclohexane during the production of cyclohexane from benzene via hydrogenation. Here propylene glycol is used as an entrainer.

How to avail Double Tax Benefit on Joint Home Loan

Monish Goyal,
Senior Manager – Planning & MIS

One of the most enticing perks of taking out a housing loan is the ability to save money on taxes. It also aids in the purchase of a fixed asset. If you obtain a home loan, you also become subject to tax benefits under the Income Tax Act Section 24 and Section 80C, 1961. Here, taking a joint home loan also brings many tax benefits to the table.

The joint home loan tax benefit is distributed among the co-applicants. Thus, more than one individual might profit. The applicant can receive a tax relaxation of around Rs.1.50 lakh per person. It will only work for debts taken out by two people. There are several advantages to buying a property under co-ownership. However, the most significant benefit of a combined property loan is that this loan provides more tax benefits, resulting in greater savings.

Tax Benefits on Joint Home Loans: What You Should Know?

For shared house loans, the tax benefits are split among the co-borrowers. It means that the tax deductions can be shared, especially if the annual payment on the home loan can be shared. That, too, with a single product, namely a house loan.

The fraction of tax deduction is determined by the loan's ownership proportion. Each candidate has the authority to claim the maximum tax refund through the house loan, which is Rs. 1.50 lakh per person and around Rs. 2 lakhs for principal repayment.

The most significant need for tax exemption and joint house loans is that the loan must be carried out in the names of two people. Naturally, everyone's share of the joint loan ownership should be explicitly stated in the paperwork in percentages for the co-owners.

Conditions for Obtaining Tax Benefit on Home Loan for Joint Owners

The three situations in which you can receive tax advantages on jointly held properties are outlined below:

1. You Must Be One of the Property's Co-Owners
You should be the property owner to receive tax advantages for a joint home loan. According to the property documentation, although the borrower is not the official owner, loans are frequently taken out jointly. You may not be able to claim tax benefits in this situation.

2. You Must Join the Loan as a Co-Borrower
Tax benefits will be applicable to applicants who are repaying the loan jointly.

3. The Property's Construction Must be Completed
Tax advantages on a residential property may only be claimed from the beginning of the fiscal year in which the property is completed. An under-construction property does not qualify for tax incentives. Any expenditures incurred before completion, on the other hand, are claimed in equal payments beginning the year in which the building is completed.

What are the Joint Home Loan Tax Advantages?

1. For a Self-Contained Dwelling
In their Income Tax Return, each co-owner who is a loan co-applicant can claim a maximum tax deduction of Rs 2 Lakh for interest on the loan. The entire interest paid is divided among the owners in proportion to their stake in the property. The borrowers' or owners' total interest claim cannot surpass the aggregate interest paid on the home loan tax benefit for joint applicant.

Let's say Rahul and his son took out a loan to buy a property and paid Rs 4.5 Lakh in interest. They own the property in a 50:50 split. Rahul can claim Rs 2 Lakh in his tax return, and his son can also claim Rs 2 Lakh.

2. In the Case of a Rented House
The amount of interest that may be deducted as a deduction for rental property is limited to the amount of loss from such property that does not surpass Rs 2 lakhs. Section 80C allows each co-owner to get a maximum deduction of Rs 1.5 Lakh for principal repayment. It is under Section 80C's total limit of Rs 1.5 Lakh.

As a result, if the house is jointly claimed and the interest outgo is Rs 2+ Lakh per year, you will be able to claim a bigger tax advantage against the interest paid on the loan as a family.

As you have read above, there are multiple ways to obtain the tax benefits on a joint home loan. The joint property owners can also claim registration and stamp duty fees.

Source: pnbhousing.com

Pollution in Sugar Industry

Gautam Kapoor,
Associate Vice President
Sugar Vertical

and

Pradosh Sanyal
Retired Professor at NSI

Pollutants is one of the facets of sugar industry. The generation of pollutants in sugar industry is inevitable and so needs its prevention without harming the normal process.

Sulphur dioxide, carbon monoxide and nitrogen oxide are main pollutants and emits from bagasse gets used to power boilers within the sugar industry. Moreover, effluents of sugar industry have complex characterizes, having pollutants to contaminate the freshwater resources, if discharged in appropriately.

Green plants produce a type of sugar called SUCROSE as a result of photosynthesis and sugar being a generic name. It is for the sweetness, colourless, water-soluble compounds that found naturally in plants.

The generation of pollutants in the form of sulphur dioxide, nitrogen oxide, carbon monoxide during the process of bagasse burning when gets used power boiler.

Apart from this, the juice fermentation units, evaporators are the other the sources that causes air pollution. However, the sugar industry attributes to air pollution majorly through bagasse burning.

Whereas the wonder lies that sugar industry uses bagasse burning as fuel for its energy source. Number of products in waste category of sugar industry are bagasse fly ash, sugar cane trash, press mud and molasses. On encountering organic constituents give birth of earthworms. Sludges are formed after the purification of sugar by Carbonation or sulphitation process as generated from solid by-products, causes the environmental effect by means of excess use of water, large quantities of agro-Chemicals, discharge and run off pollution, effect on natural habitats all relating to irrigation.

The waste generated from sugar factory is mainly bagasse, fly ash, Press mud, sugar cane trash, sugar beet trash, sugar beet mud, sugar beet pulp, molasses etc. of sugar industry has complex nature, having potential to contaminate. The freshwater resources, if discharge is done without appropriation. It is known for high biochemical oxygen demand (BOD) of sugar industry effluents.

Recycling the biomass as a source of energy and using the released water as a part of the production process will cut fossils fuel and water use. These processes will save resources and reduce environmental pollution.

Water, ground water and soil were contaminated through the discharge of sugar mills untreated effluents severely degrades the area environment. Breathing and lungs problem is due to combustion of bagasse production of many harmful emissions.

Prevention - To mitigate the environmental impact of the sugar cane industry in 5 - manners

1) Effective use of irrigation system
2) Optimum use of Inorganic Fertilizer
3) Integrated Pest management
4) Maintenance of Soil Health
5) Elimination / reduction in sugar mill pollution.

These practices include:

Raw material substitutions~ Switching to less hazardous materials.

Process modification ~ changing the production process to improve efficiency and reduce the use of toxic substances.

Equipment Upgradation ~ installing more efficient equipment to reduce raw material consumption and produce less waste.

Recycling the biomass as a source of energy and using the released water as a part of the production process will cut fossils fuel and water use. These approaches will significantly save resources and cut the environmental pollution load.

References:

1) Environmental impact Assessment: comparative review, Chris Wood
2) Impact on Environment and Pollution Control in Sugar Industry, R. Singh
3) Present status of effluent standard in India, Aarro

Thought Catalyst

Words of Wisdom

Awadhesh Nath Tiwari, Senior Manager – Marketing

"When the student is ready the teacher will appear. When the student is truly ready the teacher will disappear."

-Tao Te Ching

Words of wisdom have been intrinsic part of every civilization and when we turn the pages of ancient civilization's philosophy, we often find these life defining teachings. These are not only for mere reading but to be imbibed and acted upon.

Various ideas were propounded for specific situations prevailing that time. For e.g., strategies of war in 'Arthashastra' by Kautilya or in 'The Art of War' by Sun Tzu. These treaties, strategies and philosophies brings us various traditions of thought which has broader implications - be it in war, diplomacy or businesses.

This issue of Catalysts Connect is coming up at the beginning of a new year and marking vicenarian edition; hence some words of wisdom that guides us towards a more meaningful life.

Here are the

Japanese concepts of living

a fulfilling life:

Ikigai

Discover your purpose of life. Determine the reason you wake-up each morning.
Choose something that aligns with your strengths, passions, and the need of the world.
This is what gives life meaning.

Shikita ga nai

Let go of what you cannot change.
Recognize that some things are just out of our control, and that is okay.
Let go and focus on what you can change.

Wabi-sabi

Find peace in imperfection.
Recognize that nothing in life is perfect, including yourself and others.
Instead of striving for flawlessness, find joy in the imperfections that make life unique.

Gaman

Preserve your dignity during tough times.
Show emotional maturity and self-control, even when faced with challenges.
Remember to be patient, resilient, and understanding.

Oubaitori

Do not compare yourself to others.
Everyone has a different timeline and unique path.
It is important to focus on your own progress, rather than trying to measure yourself against others.

Kaizen

Always seek to improve in all areas of your life.
Even small changes can add up and make a big impact over time.

Shu-Ha-Ri

It is a way of thinking about how to learn and master a technique. There are 3 stages to acquiring knowledge:
1.Shu – Learn the basics by following the teachings of one master. Imitating the work of great masters also falls in this stage.
2.Ha – Start experimenting, learn from masters, and integrate the learning into practice.
3.Ri – This stage focuses on innovation and the ability to apply your learnings to a variety of situations.

Employees' Zone

New Joiners

Mehak Madan
CS
01-Nov-22

Vishwanathan B Iyer
QA/ QC
01-Nov-22

Daulat Rambhau More
BD
09-Nov-22

Awadhesh Nath Tiwari
Marketing
14-Nov-22

Yogesh Krushnarao Mane
CS
21-Nov-22

Ajay Kumar Yadav
BD
10-Oct-22

Pankaj Dhyani
SCM
10-Oct-22

Kurva Prajith Kumar
CS
02-Nov-22

Piyush
CRM
19-Dec-22

Learning & Training



Company Offsite Meet – Mukteshwar, Nainital, Uttarakhand



Team Offsite- Goa



Work hygiene training at Production centre

Employees' Zone

Celebrations

New team members in Catalysts' fleet of vehicles at NKT & Hyderabad office

Hyderabad office 1st year anniversary celebration

Capacity Expansion: New warehouse at Sahibabad, Ghaziabad, Uttar Pradesh

Christmas eve celebration at our offices across India

New Year eve and 'Highest Sales Achieved in 1 month ever' celebration

Celebrations



Independence Day celebration

CSR Initiative at Nirbhed Foundation, Ghaziabad, Uttar Pradesh



Dussehra celebration

Diwali celebration






Employees' Zone

Events / Conferences

Catalysts Group has sponsored the UPDA event held on 5th Aug 2022 in New Delhi.

STAI Sugar Conference at Goa – July 2022

Fermentis Distributors Meet, Bangkok, Thailand – October 2022
Catalysts Brewer team was invited by its channel partner 'Fermentis' for 'APAC Craft Beer Distributors Meet'

Events / Conferences

Fermentis Academy Training, Pune Maharashtra – November 2022
Team Catalysts participated in the training program, for channel partners, conducted by Fermentis.

ALCOTECH Expo, Lucknow, Uttar Pradesh – November 2022
Catalysts participated in Alcohol technology Expo.

Fermentis Academy Meet, Gurugram, Haryana – November 2022
Team Catalysts participated in the meet, for channel partners, conducted by Fermentis.

CPHI Expo, Delhi-NCR – November 2022
Team Catalysts participated in CPHI Expo

LEAF Technical Workshop – Hyderabad, Telangana – December 2022
Catalysts participated in the technical workshop conducted by our channel partner, leaf by Lesaffre

Drink Technology India, Mumbai, Maharashtra – December 2022
We in this International Trade Fair for Beverage, Dairy & Liquid Food industry and was panellist for the discussion on 'Impact on raw material supplies due to inflation across the world'.

Catalysts

making things happen...

ISO 9001:2015 Certified | FSSC 22000 Certified

CORPORATE OFFICE

240, Functional Industrial Estate,
Patparganj, Delhi - 110092, India

REACH US

+91 11 49867313 / 49867314
info@thecatlystsgroup.com
www.thecatalysysgroup.com
thecatalystsgroup catalysts_2 catalystsgroup

Certifications:

Catalysts Connect is a Catalysts Group Publication.
The view/pictures/articles used or expressed in this Magazine are not necessarily those of the Catalysts Group.