

Catalysts

Connect

Jan-Feb-March 2016 Vol No 21

**Managing Cooling
Tower Efficiency:
Obstacles & Solutions**

**Cheers to Beer:
12 Unexpected Benefits**

**Beer Head:
A Visual Delight**

**Power of Consistency:
5 Rules**



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ABOUT THE GROUP

The Catalysts Group is among the top 5 Indian biotechnology companies, active in industrial enzymes business segment.

Our 12+ years experience of enzyme application in sugar as well as alcohol industries have given us a distinctive edge in creating customized products. Application of our products not only increases process efficiency, but also results in higher ethanol recovery.



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MESSAGE FROM THE MANAGING DIRECTOR



On behalf of Catalysts Group, I'd like to wish you all the best as we begin another journey of challenges, successes, learning's and growth in the fiscal calendar of 2016-2017. Whilst in pursuit of achieving our vision 2020 and continuing to deliver high quality products and services to our customers, Catalysts has clocked another successful financial year in 2015-2016.

We have witnessed many challenges like country wide drought, aggressive competition, extremely difficult times in Sugar Industry, stricter pollution control norms to name a few, over the last 12 months.

I believe that we are well equipped to meet all the challenges and opportunities head on. As by the very nature, Catalysts team and management are a team of proud, happy and enthusiastic about their work, highly competent, resilient and self-aware individuals. We believe in evolving as an organization and would continue to keep doing so in the coming year.

To everyone who is a part of the Catalysts family, our customers and business partners, I would like to once again wish you all a fruitful and successful new financial year. Let's work towards making the Vision 2020 happen.

Keep going strong and God Bless!

A handwritten signature in blue ink, appearing to read 'Munish Madan'.

Munish Madan

MESSAGE FROM THE DIRECTOR



Dear Partners,

In the new financial year 2016-17, we at Catalysts will be more focused on our 4 key verticals viz Sugar, Grain alcohol, Molasses alcohol & Brewing.

Some new applications like speciality yeast for whisky and some unique enzymes for Brewing will give strong impact on 2016-17 years sales. Along with our partners we have been able to establish newer technologies in grain processing segment which enhances the yield significantly thus reducing the overall cost. At a pan India forum, we along with our partners Leaf have launched yeast for molasses which was the global launch of the product in India. Our in house research applications for molasses preservation & water treatment continue to add significant contributions to our product basket.

In the International segment, apart from molasses we have started exporting our products from other industry verticals too.

With an objective to achieving the budgeted target, more investment has been planned on the man power and focused trainings of individuals for their respective roles.

We once again thank each one of you for making 2015-16 a successful year for Team Catalysts.

A handwritten signature in blue ink, appearing to read 'Aditya Malhotra'.

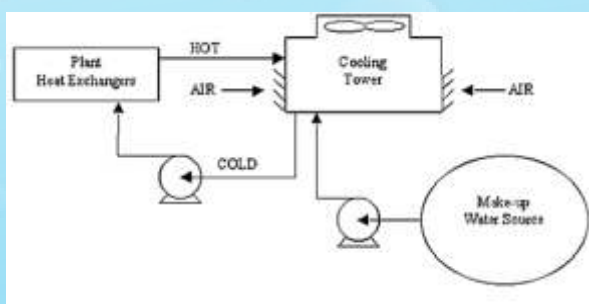
Aditya Malhotra

Managing Cooling Tower Efficiency: Obstacles & Solution

Prabhat Yadav, Business Development Department
Dr. Jai Shankar Arya & Dharmender Pathak, R&D Department

INTRODUCTION

Cooling towers are essential part of many chemical plants. The primary task of a cooling tower is to eliminate heat into the atmosphere. They represent a relatively inexpensive and dependable means of removing low-grade heat from cooling water. The make-up water source is used to replenish water lost to evaporation. Hot water from heat exchanger is sent to the cooling tower. The water exits the cooling tower and is sent back to the exchangers or to other units for further cooling. Typical closed loop cooling tower system is shown in the figure.



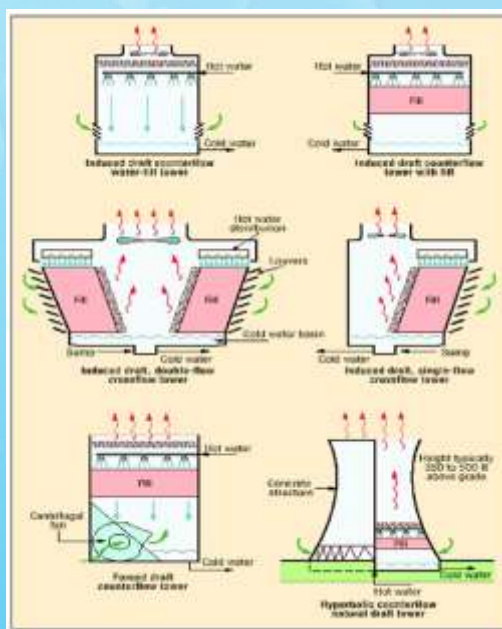
COOLING TOWER TYPES

Cooling towers fall into two main categories: Natural draft and Mechanical draft

- **NATURAL DRAFT TOWERS** use very large concrete chimneys to introduce air through the media. Due to the large size of these towers, they are generally used for water flow rates above 45,000 m³/hr. These types of towers are used only by utility power stations.
- Mechanical draft towers utilize large fans to force or suck air through circulated water. The water falls downward over fill surfaces, which help increase the contact time between the water and

the air - this helps maximize heat transfer between the two. Cooling rates of Mechanical draft towers depend upon their fan diameter and speed of operation. Since, the mechanical draft cooling towers are much more widely used.

The figure below illustrates various cooling tower types. Mechanical draft towers are available in a large range of capacities. Normal capacities range from approximately 10 tons, 2.5 m³/hr flow to several thousand tons and m³/hr. Towers can be either factory built or field erected, for example concrete towers are only field erected.



COOLING TOWER PERFORMANCE

The important parameters, from the point of determining the performance of cooling towers, are:

- **"Range"** is the difference between the cooling

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tower water inlet and outlet temperature.

- **"Approach"** is the difference between the cooling tower outlet cold water temperature and ambient wet bulb temperature. Although, both range and approach should be monitored, the 'Approach' is a better indicator of cooling tower performance.
- **Cooling tower effectiveness** (in percentage) is the ratio of range, to the ideal range, i.e., difference between cooling water inlet temperature and ambient wet bulb temperature, or in other words it is
$$= \text{Range} / (\text{Range} + \text{Approach})$$
- **Cooling capacity** is the heat rejected in kCal/hr or TR, given as product of mass flow rate of water, specific heat and temperature difference.
- **Evaporation loss** is the water quantity evaporated for cooling duty and, theoretically, for every 10,00,000 kCal heat rejected, evaporation quantity works out to 1.8 m³. An empirical relation used often is:
***Evaporation Loss (m³/hr)**
$$= 0.00085 \times 1.8 \times \text{circulation rate (m}^3/\text{hr)} \times (T_1 - T_2)$$

 $T_1 - T_2$ = Temperature difference between inlet and outlet water
- **Cycles of concentration (C.O.C)** is the ratio of dissolved solids in circulating water to the dissolved solids in makeup water.
- **Blow down** losses depend upon cycles of concentration and the evaporation losses and is given by relation:
$$\text{Blow Down} = \text{Evaporation Loss} / (\text{C.O.C.} - 1)$$
- **Liquid/Gas (L/G) ratio**, of a cooling tower is the ratio between the water and the air mass flow

rates. Against design values, seasonal variations require adjustment and tuning of water and air flow rates to get the best cooling tower effectiveness through measures like water box loading changes, blade angle adjustments. Thermodynamics also dictate that the heat removed from the water must be equal to the heat absorbed by the surrounding air:

$$L (T_1 - T_2) = G (h_2 - h_1)$$

$$L/G = (h_2 - h_1) / (T_1 - T_2)$$

where:

L/G = liquid to gas mass flow ratio (kg/kg)

T₁ = hot water temperature (°C)

T₂ = cold water temperature (°C)

h₂ = enthalpy of air-water vapor mixture at exhaust wet-bulb temperature (°C)

h₁ = enthalpy of air-water vapor mixture at inlet wet-bulb temperature (°C)

FACTORS AFFECTING COOLING TOWER PERFORMANCE

- **Capacity:** Heat dissipation (in kCal/hour) and circulated flow rate (m³/hr) are not sufficient to understand cooling tower performance. Other factors, which we will see, must be stated along with flow rate m³/hr. For example, a cooling tower sized to cool 4540 m³/hr through a 13.9°C range might be larger than a cooling tower to cool 4540 m³/hr through 19.5°C range.
- **Range & Approach:** Range is determined not by the cooling tower, but by the process it is serving. The range at the exchanger is determined entirely by the heat load and the water circulation rate through the exchanger and on to the cooling water.
$$\text{Range } ^\circ\text{C} = \text{Heat Load in kcals/hour} / \text{Water Circulation Rate in LPH}$$

Approach °C = Cold Water Temperature - Wet Bulb Temperature

- **Heat Load:** The heat load imposed on a cooling tower is determined by the process being served. The degree of cooling required is controlled by the desired operating temperature level of the process.
- **Microbial Contamination:** Microorganisms that are present in the water cooling system that can be bad effects on the corrosion and deposition create operational efficiencies. This caused by micro-organisms in the corrosion of iron will take. Since water of cooling towers are the good conditions for the growth of organisms.

Continuous growth and accumulation of microorganisms in the water cooling system is causing a serious problem. Facility that cannot be controlled microbial growth in the water, often with erosion and sedimentation problems we face. Another problem that microbial invasion of the cooling tower is causing wood rot. This not only decreased operational efficiency, but also increased the cost of the plant is operational. Many microorganisms are found in cooling water to use hydrogen in their metabolism that often the result of being nonpolar and cathodic corrosion reactions. The release of hydrogen from the metal surface corrosion reaction conditions is provided. By algae release oxygen as part of their metabolism causes nonpolar cathodic reaction and corrosion is accelerated.

In general, metabolic processes of living organisms on microscopic methods can be effective corrosion behavior.

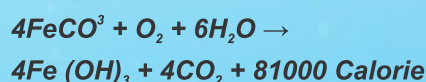
- The adverse effects caused by chemicals (sulfuric acid, organic sulfides and inorganic and organic acids and other corrosive compounds).

- Formation of localized corrosion and electrochemical cells with changes in oxygen levels, salt concentration, PH, sulfur and other parameters.
- The cathodic polarization occurs which results in the growth of anaerobic bacteria.
- Remove or less number of decreasing corrosion materials (such as the oxidation of nitrites and amines).

Basically, bacteria due to the different mechanisms are classified into different groups which briefly most important ones and their problems as follows.

1. Iron-Oxidizing Bacteria

These bacteria are usually found in fresh water and salt water occasionally. These bacteria are aerobic and enabling to grow in environment that amount of oxygen is 5.0 ppm. They produce large amounts of sludge mass. Iron bacteria such krinvtiks, lipvtiks, Galivnla, use the iron soluble salts for their growing and deposited insoluble iron compounds as secondary products of metabolism, the reaction is as follows:



2. Acid Bacteria Causing

Two major types of acid-producing bacteria are: aerobic sulfur bacteria capable to oxidize sulfur and sulfate into vitriol (sulfuric acid) and another type of bacteria which are able to produce organic acids.

a. Corrosion of Organic Acids

The process of metabolism produces the anaerobic bacterial of organic acids such as lactic acid. Except of bacteria, some fungi affect of your metabolism produce organic acids such

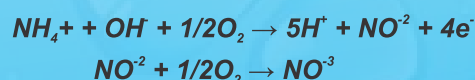
as acetic acid and formic acid. The acid in the presence or absence of oxygen leave negative effects on metal corrosion and material. High temperature and humidity conditions that are produced by fungi cause to corrosion electronics in stores.

b. Sulfate-Reducing Bacteria

The most common bacteria involved in the biological corrosion are Sulfate Reducing Bacteria (**SRB**). Usually these bacteria are abundant in the environment in soil and water. In general, the sulfate reducing bacteria called which are able to regenerate inorganic sulfate to sulfide. These bacteria are anaerobic and in the environment that there is no oxygen able to grow and multiply. There are other species aerobic bacteria and anaerobic that able to regenerate sulfur compounds to sulfide and the importance of bacterial sulfate reduction. These bacteria are able to consume hydrogen and some other organic material and reducing sulfate ions to sodium sulfite gain energy needed for their growth. Sulfide ion induced adverse effects on steel corrosion. The presence of these bacteria is characterized by the deposition of iron sulfides. Sulfide compounds produced by the bacteria are deposited on surfaces compared to steel; the situation is more cathodic and accelerated corrosion to the steel.

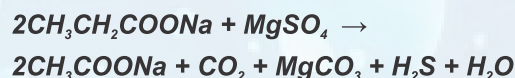
3. Other Bacteria

Nitrogen eating bacteria attend to the various reverse reactions (both sides). They just have ammonia or oxidize nitrites (reduced corrosion providers).



There are other types of string bacteria as

they iron eating bacteria accumulate iron, analyze and accumulate oil and hydrocarbons. Change in this material lead to product harmful material such as HCL, H₂S, and CO₂:



New water (fresh water) are used to cool the system may be in the condenser water boxes there are other organisms such as worms, mites, snails can accumulate and cause clogging. The cooling tower that are used salt water, water boxes may found marine like shells, starfish and other deposits that can reduce the efficiency of system in the time of stop machine, analyzed of organic organisms produce organic acids which is caused by Increase the corrosion of machine. It is necessary when stopped machine must be rinsed cooling water with fresh water until removing solid waste and water organisms; surface condenser tubes are rinsed with fresh water to prevent corrosion by the salt sea.

E. PREVENTION OF MICROBIAL CONTAMINATION

Catalysts Biotechnologies Pvt. Ltd. designed a product to control the microbial proliferation in cooling tower ultimately to enhance the cooling tower life & heat exchange efficiency.

TREATFLOW CT (ANTI-MICROBIAL SOLUTION FOR COOLING TOWERS):

Cooling towers are a very important part of many chemical plants which reject heat into the atmosphere. They represent a relatively inexpensive and dependable means of removing low-grade heat from cooling water and replenish water lost to evaporation in atmosphere.

The water streams running in cooling tower have

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wide variety of microbial flora. Such water streams work as a good media for rapid growth of various microbial flora like; Algae, fungus, bacteria etc.

Algae requires sun light, water & air while fungus & bacteria require carbon, nitrogen, water and air conditionally. All these requirements for such microbial growth is available in cooling tower like water, air, sunlight and carbon & nitrogen source as COD of organic compounds & essential elements from COD of inorganic compounds.

Microorganisms that are present in the water cooling system that can be bad effects on the corrosion and deposition create operational efficiencies. This caused by micro-organisms in the corrosion of iron will take. Since water of cooling towers are the good conditions for the growth of organisms.

Catalysts Biotechnologies Pvt. Ltd. is a pioneer to provide industrial solution for process efficiency improvement & industrial revenue generation by recovering the loss. In this way of working, Catalysts Biotechnologies Pvt. Ltd. is now providing a best solution for cooling tower microbial growth inhibition by introducing an efficient product termed as “**TREATFLOW CT**” and controls wide variety of microbial flora present in cooling towers of industries.

TREATFLOW CT is target preservative for microbial growth inhibition. It works as algaecide, fungicide & bactericide to control wide variety of microbial flora present in cooling towers of approx. all industries verticals.

- Prevent corrosion initiated by microbial contamination
- Improves cooling tower efficiency
- Low doses with efficient output
- Prevent generation of off smell in cooling tower
- Prevent heat loss due to microbial growth specially algae & fungus layers
- Help to recover revenue by reducing efficiency loss of cooling tower

BENEFITS

- Prevent formation of slime & algae in industrial water system

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- <https://beeindia.gov.in/sites/default/files/3Ch7.pdf>
- International Journal of Basic and Applied Science

Cheers to Beer: 12 Unexpected Benefits

Ashish Sharma, Business Development Department

A cold lager is refreshing on a summer afternoon, while a hearty porter or stout will warm you up faster than cuddling by a fire on winter's coldest nights. But beer, a crowd pleaser for all tastes and all seasons, also brings unexpected benefits.

While there are many health benefits of beer, who among us hasn't rounded down when doctors or nutritionists ask how much we imbibe? The health conscious avoid the malty beverage due to the high calorie content. Calorie counts range from approximately 100 calories in light beers, while an Olde English High Gravity malt-style beer weighs in at 220 calories per serving. A couple of those a day will quickly lead to a beer belly, but don't take a vow of sobriety just yet!

Here are 12 reasons to raise a glass or bottle to your good health:

1. PORTION CONTROL

Beer is conveniently packaged in a portion control bottle. It's easy to limit it to one-or at least keep track of how many you've had.

2. RICH IN VITAMIN B

Beer is full of Vitamin B from the yeast. Unfiltered beer is especially high in B3, B6 and folic acid (B9). B3 aids in cell repair and B6 eases PMS. Folic acid aids in colon cancer prevention.

3. HIGH IN FIBER

Beer contains fiber, which acts as a natural laxative. It also slows the rate at which food leaves your stomach, which means it suppresses appetite. So indulge in a beer and know you're preventing overeating.

4. STRESS REDUCTION

A beer a day keeps stress and heart attacks away. Moderate alcohol consumption can reduce stress and anxiety, known contributors of heart disease. According to the Mayo Clinic, alcohol reduces risk of dying of a heart attack and possibly reduces risk of strokes. "Moderate" is defined as up to 12 ounces per day for women and 24 ounces per day for men. Drink to that.

5. LOWER RISK OF TYPE-2 DIABETES

Multiple studies have shown that beer drinkers had an approximately 30% lower risk of type-2 diabetes than test subjects who abstained.

6. BEER DRINKERS HAVE A LOWER RISK OF DEVELOPING GALLSTONES

Beer drinking is associated with a reduced risk for gallstones, according to the Mayo Clinic. Gallstones are made up of cholesterol, bile and other things that cause pain in the stomach. No one wants to deal with that.

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7. IT HAS ANTI-MICROBIAL PROPERTIES

Hops, the bitter flowers used in brewing, are known to be antimicrobial, which could fight disease.

8. IT'S GOOD FOR YOUR MUSCLES

Muscles benefit from a substance in hops that keeps muscle from deteriorating.

9. IT'S HIGH IN SILICON

Two brewskis a day could help prevent Alzheimer's disease, according to a 2007 study at the University of Alcalá in Spain. The research suggests a high intake of silicon limits aluminum absorption in the brain, which in turn could aid in the prevention of Alzheimer's.

10. MODERATE BEER CONSUMPTION IS GOOD FOR BONE DENSITY

Beer could keep bones strong. Researchers at Tufts University found a positive link between beer or wine consumption and hip-bone density. Heavy drinking, however, led to bone loss, according to the same study, so be conservative.

11. REDUCES THE RISK OF HEART DISEASE

Red wine is often touted as the healthiest alcohol choice, but a Kaiser Permanente study says not so fast. Incidences of heart disease for beer drinkers were lower than for wine or whiskey drinkers.

12. IT'S A SOCIAL LUBRICANT

A brew also has social benefits. A beer can loosen you up a bit for a networking event. Alcohol can boost courage and chattiness, according to a University of Washington study. However, some people continue to drink because of the perceived expectation that if one is good, a lot is even better. We all know more beer doesn't make us more charming and attractive. Everyone knows how that story ends.

So, take that teetotalers!
Ales and lagers are actually good for you (in moderation).
Cheers!!!

Source: Life Hack

Beer Head: A Visual Delight

Rohit Chauhan, Business Development Department



First impressions count. Most consumers drink with their eyes and appearance is often more important than taste.

When ordering a pint the consumer will judge the beer by:

- Clarity
- Color
- Foam

Beer is a supersaturated solution of gas. In the case of lager this is carbon dioxide, but in the case of ales may be a mixture of carbon dioxide and nitrogen gas. When the beer is poured out (either from a bottle or draught) the gas bubbles break out from solution and rise to the top of the glass. This effect is called “tracing” and many beer glasses have roughened bases inside the glass, which act as nucleation sites, to encourage tracing.

The foam in beer is generally considered to be the head on the top of the glass. There are also other important visual effects from the foam adhering to the side of the glass called “Cling” or “Lacing”. This effect is particularly noticeable in beers, which form larger heads and have better foam performance.

When considering beer foam it is necessary to look at two complementary conditions in order to ensure a satisfactory foam performance:

- The head formation, which is the ability of beer to form a head when poured
- The head retention, which is the ability of beer to retain a head once it has formed, after dispense

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It is necessary to have adequate head formation in order to ensure sufficient foam remains during the consumption of the beer. In some markets bottle beer is drunk directly from the bottle and head has no impact on the quality perceptions of these beers.

THE STRUCTURE OF BEER FOAM

The formation and breakdown of beer foam occurs in four stages:

- Bubble formation
- Drainage
- Coalescence
- Disproportionation

Bubble formation occurs where bubbles are formed from a supersaturated beer at nucleation sites in the glass. Gentle pouring and low beer surface tension encourage the formation of smaller bubbles, which produce more stable “creamy” type foam.

After bubble formation drainage of beer from the foam by gravity starts to occur and the bubbles start to shrink and collapse. The rate of drainage can be reduced by factors such as small bubble size, the amount of hydrophobic interactions, reduced surface tension, and increased liquid viscosity.

Other components, such as lipids from food or brewing materials, dirty glasses and some cleaning fluids disrupt the bubble film causing the foam to collapse.

The final stage in foam collapse is due to disproportionation when the gas from smaller bubbles, which is under higher pressure, diffuses into the larger bubbles, which is under lower pressure, creating larger “bladdery” bubbles, which collapse more quickly.

Nitrogen is less soluble in beer than carbon dioxide and hence the bubble size is smaller. This means that disproportionation is slower for beers with mixed gas giving the “creamier” appearance and better foam stability.

FACTORS WHICH IMPROVE FOAM PERFORMANCE

Anything which encourages the formation of gas bubbles and gas breakout improves the stability of the gas bubbles and will consequently improve the presentation and foam stability of the beer.

The presence of dissolved gas

Bubbles have to be created in order to form a head. This requires a minimum level of dissolved carbon dioxide or mixed gas (mixed carbon dioxide and nitrogen). Typical values are:

- Lager beers-between 5 and 6 g/l carbon dioxide
- Ales-(usually but not always lower) at between 2.5 and 5 g/l. The carbon dioxide content is often supplemented by 15 to 20 ppm nitrogen gas for mixed gas dispense.

Bubble formation will also be influenced by external factors such as temperature. The solubility of carbon dioxide in particular increases with a decrease in temperature, and hence beers dispensed at low temperatures (for example very cold lager dispense) will produce less foam unless the carbonation level is increased proportionately.

FOAM STABILIZATION BY REDUCING SURFACE TENSION

The main factor which reduces the surface tension in the foam and stabilizes the bubbles is hydrophobic (water hating) protein or polypeptides. These hydrophobic proteins come from the raw materials principally the malt.

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Only a small proportion of the malt derived protein is responsible for foam stabilization. The balance of the protein is used as yeast nutrients (amino nitrogen) or can cause colloidal instability (chill and permanent haze). Considerable research has been carried out to identify the exact fraction of protein responsible for improving foam stability.

Foam-positive proteins can be divided into two fractions based on molecular weight:

- High molecular weight (HMW, 35-50 kDa) fraction containing mainly protein Z 23
- Low molecular weight (LMW) fraction containing LTP1 (lipid transfer protein 1) and a mixture of hordein and glutelin fragments.

These proteins form a ring around each bubble reducing the relative surface tension and stabilising the foam.

Factors which increase the amount of these proteins in the packaged beer and will subsequently improve the head retention:

- Grist with malt made from high nitrogen barley and all malt grist will contribute increased nitrogen to the wort
- Poorly modified malts have less protein breakdown resulting in worts with higher protein content
- It is necessary to avoid excessive wort boiling or excess use of kettle finings which increase the amount of protein removed as hot and cold break
- Every time the beer foams it uses up some of the precious foam stabilizing proteins, which are left behind as a crust on the vessel walls. Avoiding beer fobbing during boiling and all subsequent transfers reduces the loss of foam proteins and ensures more continue into the packaged beer.
- Protein compounds can also be lost during processing through maturation and tight filtration. Care in these areas will improve foam potential.
- Foam proteins are susceptible to breakdown by proteolytic enzymes, which can come from the yeast particularly if the yeast has been stressed (old yeast or poor yeast handling) and these along with any other proteases added can seriously reduce the foam potential of the beer.
- It is reported that there is a greater loss of foam potential in a beer brewed at high gravity when compared to the similar product brewed at sales gravity. It has been shown that foam potential proteins are lost more readily from higher gravity worts. Currently there is no simple explanation for this observation.

In addition to the hydrophobic proteins, iso-alpha acids from the hops also exhibit hydrophobicity and hence make an important contribution to foam stability. The hops are thought to help bridge between the bubbles adding additional support. Some brewers use reduced hop compounds to improve foam stability.

Reduced hop compounds such as tetra-iso-alpha acids are made from hydrogenating the double bonds in iso-alpha-acid.

As well as giving the hop compound protecting against break down under ultra violet light it also makes the molecule more hydrophobic, thus increasing its foam stability when compared to standard iso-alpha acid.

FACTORS WHICH PRODUCE POORER FOAM PERFORMANCE

It follows that anything (including grist composition), which has an effect on reducing the level of proteins and iso-alpha acid, will tend to produce beers with poorer foam performance.

However, the foam potential can also be reduced by the process conditions, for example excess foaming during transfers, which will reduce both protein and hop compounds and through the effects of protease enzymes, which will breakdown the foam proteins.

Lipids, grease and detergent are detrimental to foam performance. Lipids can form a wall around the bubbles preventing the stabilizing action of hydrophobic proteins and iso-alpha acids, thus increasing the surface

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tension causing the foam bubbles to collapse.

The fatty compounds can be picked up during the brewing and dispense process, with one of the most common areas being poor quality glass washing.

Beer contains a lipid binding protein, which comes from the raw materials and has the ability to reduce lipid induced foam collapse.

However, many brewers chose to add Propylene Alginate Glycol (**PGA**) as a process aid, which binds to bubble walls and protects them from penetration by lipids.

THE MEASUREMENT OF FOAM STABILITY

There are two principle methods used for evaluating head performance:

A. Determination of Head Retention by Rudin

Principle: It measures the length of time it takes for the foam from gassed up beer to collapse between two set points in a narrow tube.

Method: Degassed beer is placed in a narrow tube and CO₂ is introduced into the bottom of the tube. The beer is gassed up to form a foam head until a pre-set line is reached. The speed with which the foam collapses between two marked points is measured.

Standard: A satisfactory head is one that lasts for longer than 90 seconds by Rudin method. This method is better at measuring the foam potential of the beer rather than the actual performance of the beer in trade since it introduces its own level of carbonation.

Advantages:

- It measures beer intrinsic ability to foam-i.e. foam potential
- It eliminates the variations due to carbonation and as a dispense gas because CO₂ used to produce foam.

Disadvantages:

- The narrow glass tube has large surface area to volume ratio and is not representative of the performance of the foam in a beer glass. Since additional CO₂ is added it does not truly reflect the actual performance of the beer in trade.

B. Determination Of Head Retention By Nibem

Principle: It measures the time taken for the surface of foam to collapse by 10mm, 20mm and 30mm using conductivity.

Method: A standard pour is used to pour the beer into a glass. A movable plate containing three electrodes is lowered so that it just rests on the surface of the beer foam. As the foam collapses the signal received by the electrodes reduces. The plate moves down to maintain contact with the foam. The more rapidly the needles move down to maintain contact, the less stable the foam.

Standard: A satisfactory head is one that lasts more than 260-280 seconds by Nibem. Since no additional gas is added this method will give an indication of the performance of the beer foam in trade.

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Advantages:

- Measurement gives a better indication of probable foam performance under real dispense conditions.

Disadvantages:

- Can be difficult to get reproducible results
- susceptible to drafts and temperature

Although these are the most common analytical methods used for measuring foam performance there are a myriad of other methods proposed and used to measure both foam collapse and assess lacing on the glass.

Many of the methods rely on visual assessments of the foam for both head retention and cling.

More sophisticated systems use computer and video camera technology or infrared analysis to automate the visual observations and to reduce the subjectivity of the methods.

SUMMARY OF THE KEY FACTORS AFFECTING FOAM STABILITY

Anything which encourages the formation of gas bubbles and gas breakout and improves the stability of the gas bubbles will improve the presentation and foam stability of the beer.

The following factors are important when producing the best foam on a beer:

- The beer should have sufficient levels of dissolved carbon dioxide or gaseous nitrogen to produce a good foam head
- The dispense temperature should be sufficiently warm to allow normal gas breakout
- Small bubbles are required for the best head retention
- Good quality malt with total soluble

Nitrogen of between 0.5-0.75% ensures sufficient amounts of hydrophobic proteins are present in final beer. An all malt grist with low malt modification with the addition of wheat or barley will increase the level of hydrophobic proteins.

- Higher bitterness will increase the iso-alpha acid concentration, which helps foam stability. Better results are achieved if part of the iso-alpha acid is replaced with a reduced version such as tetra-iso-alpha acid to between 3.5-5 ppm).
- Care is required in the brewhouse to avoid excessive breakdown of proteins during mashing or loss as hot and cold break. This requires the use of appropriate temperature and pH conditions for mash to allow survival of sufficient amounts of hydrophobic proteins.
- Care must be taken to avoid fobbing as this will result in the loss of both hydrophobic proteins and iso-alpha acids
- Yeast handling and removal of tank bottoms is a priority to prevent yeast stress and the leaking of protease enzymes, which can damage foam
- Better foam stability is obtained with beers brewed at sales gravity over those brewed at high gravity. Higher alcohol products (those with more than 7 or 8% alcohol by volume) tend to have poorer foam performance.
- Addition of propylene glycol alginate to combat the negative effects of fatty compounds
- Good foaming beers can easily be ruined in trade. Good line cleaning and well rinsed glasses with approved glass rinse chemicals are required to avoid the risk of grease or detergent getting into beer.

Source: Technical Summary 7 by Tim O'Rourke

Feeding the world with micro bacterial agriculture

Rakesh Joshi, Research & Development Department

It was a remarkable affair, early in Earth's history; bacteria embedded it deep inside certain cells, forming an intimate liaison that has lasted throughout time. The adventurous bacteria were safer in their new residence, and the cells got a very powerful source of energy. The bacteria could convert sunlight and carbon dioxide into sugar, hence providing their hosts with the power of photosynthesis. This partnership ultimately spawned the evolution of plants. Now scientists are looking to harness the intertwined evolutionary history between microbe and plant once more. They want to use it to help solve one of humanity's greatest challenges.

It is predicted that by 2050 there will be nine billion people on Earth. To feed the growing masses we may need to boost agricultural yields by more than 70 per cent. But we're running out of tools to help us. Without sacrificing biodiversity, there's little new arable land left. Water resources are limited. Plant diseases and weeds are slowly becoming resistant to pesticides. And in the developed world, we can't dump any more fertilizer on our plants – rather than producing more food, the phosphorus and nitrogen is leaching into groundwater. Rising salinity, soil erosion and extreme weather will make the task of producing food ever more difficult.

To stave off hunger, scientists – along with the multibillion-dollar agriculture industry – are looking to exploit the very life forms that gave us plants. An interesting array of bacteria, as well as fungi and viruses, has recently been discovered living in, on and around plants. Collectively known as the plant micro biome, these beasts provide plants with nutrients, kill diseases and even pump out hormones spurring crops to grow. After decades of killing bugs through pesticides and fungicides, we are coming to understand we need them. Forget the green revolution-microbiologists are starting a microbial revolution.

In 2013, an ambitious report entitled “How Microbes Can Help Feed the World”, written by the American Academy of Microbiology, argued that the micro biome was a largely untapped resource that could fuel a new wave of agriculture. They set a goal to increase agricultural output by 20 per cent in 20 years, using 20 per cent less fertilizer. Could microscopic bugs really achieve this feat?

Farmers have known for some time that certain bacteria and fungi help plants grow. Perhaps most famously, bacteria colonizing the root of legumes can fix nitrogen, so converting unusable gaseous nitrogen into a form plants can feed on. Before there was an industrial way to fix nitrogen, much of our agriculture depended on these tiny microbes. Similarly, it's well known that microscopic fungi partner up with plant roots, fashioning long threads that reach deep into the soil to help plants access nutrients, minerals and water. But, according to Keith Clay, a professor of biology at Indiana University, this is “the tip of the iceberg – there's another world out there” new technology has changed the game here. In a gram of soil there are about 10 billion bacterial cells, with up to 10,000 different species of bacteria. Until relatively recently, we could only study a fraction of these bugs-the few that would grow on laboratory culture. This meant that entire families of life, such as fungi that live inside plant cells, were invisible to scientific understanding. Clay says these bacteria are critical to plant health “and almost none of these have been isolated or described”.

Through these experiments scientists have found an incredible connection between plants and their microbes. Plants ooze “come hither” chemicals to attract beneficial microbes. “They're basically saying, ‘It's really nice over here, come live with me,’” says Dr Cathryn O'Sullivan at the CSIRO. Arabidopsis plants, for example, secrete an acid to recruit probiotics that help them fight infections. Exploiting this relationship is hoped to

FEATURES

reduce the need for pesticides in agriculture. Small experiments have already found that inoculating crops, such as rice, with the right bacteria could protect them from disease.

Organic farming is an approach to agriculture where the aim is to create integrated human, environmentally and economically sustainable agricultural production systems. In organic, maximum reliance is placed on locally or farm derived renewable resources and the management of self-regulating ecological and biological processes and interactions in order to provide acceptable levels. Meanwhile other bacteria can boost agricultural output. *Pseudomonas*, which live in the soil around a plant, make hormones goading roots to grow. In one trial, inoculating wheat with a cocktail of these bugs over two years increased yields by more than 30 per cent. Another bacteria, *Burkholderia*, has been shown to ramp up rice production. O'Sullivan wants to use these plant steroids to inspire crops to grow during drought. "There is a lot of potential here," she says. And in the furiously hot soils of Yellowstone National Park, where temperatures reach 70 degrees Celsius, one hardy plant survives: panic grass. This super power comes from a curious ménage à trois between a fungus, which has infected the grass, and a virus living inside the fungus. It's believed that the two organisms work in cahoots to flick on a stress response in the plants, enabling them to live in the toxic heat. Researchers are looking to exploit this threesome to grow crops in extreme environments, perhaps by inoculating corn and rice with the microbes.

With the right cocktail of bugs, we may be able to use less fertiliser, such as phosphorus and nitrogen. Plants need these elements to grow, but there is a limit to how much of the stuff we can chuck onto crops. Phosphorus, for example, reacts with iron, aluminium and calcium in soils, rendering it solid and hence largely useless to plants. Certain strains of bacteria and fungi can pump out enzymes that turn phosphorus into a soluble form that crops can use. Already, glasshouse experiments have found that tomato and wheat that are infected with particular concoctions of bacteria need less fertiliser to produce the same yield.

The tricky thing will be taking these small, but promising, experiments into the farmyard around the globe. "There is a big step from the pot to the field," says O'Sullivan. "You have to make sure that it's safe." After all, bacteria that are beneficial in controlled quantities in a pot could turn bad if they dominate their new environment. Mass producing microbes and shipping them internationally may also prove to be problematic and unsafe. And there's another concern. We are uncovering a new ecosystem here, one whose complexity has been compared to the complex food web of herbivores, predators, scavengers, plants and pollinators that sits above the ground. Introducing a new cocktail of microbes into a world we don't fully understand may be unwise. On the other hand, we've probably fouled much of this minuscule community with fertilizers and pesticides already. And soon, as a species, we'll be getting hungry.



Source: Wendy Zukerman & Asian Productivity Organization.

Power of Consistency: 5 Rules

Eric Holtzclaw



Throughout my career, I've strived to stay consistent about consistency. Even the best business plans will fail without a dedication to consistency. If I say I'm going to do something, I do it. If I say I'm going to be somewhere, I'm there. If I initiate a new business process or initiative, I follow through. In my experience, consistency is a must as you build and grow your business.

Here's why:

1. CONSISTENCY ALLOWS FOR MEASUREMENT

Until you have tried something new for a period of time and in a consistent manner, you can't decide if it works or not. How do you measure effectiveness if what you are measuring isn't performed consistently? I typically give new initiatives, processes, and organizational structures at least six months before judging them a success or failure. It's often minor tweaking instead of major overhauls that make the difference.

2. CONSISTENCY CREATES ACCOUNTABILITY

I ask my employees to be accountable for their deliverables and goals. They should expect the same in return from my leadership. I put a priority on making time for and being available to my team. I work to establish consistent and recurring meetings when a project or aspect of the business requires attention. The simple fact that there is a set time to report on progress is often the catalyst that moves an initiative along to a successful end.

3. CONSISTENCY ESTABLISHES YOUR REPUTATION

Business growth requires a track record of success. You can't establish a track record if you are constantly shifting gears or trying new tactics. Many efforts fail before they get to the finish line, but not because the tactic was flawed or goals weren't clear. The problem is often that the team simply didn't stay the course to achieve the objective.

4. CONSISTENCY MAKES YOU RELEVANT

Your employees and your customers need a predictable flow of information from you. All too often I see businesses, both small and large, adopt a campaign or initiative only to end it before it gains traction. It's effective to run many advertisements, numerous blog entries, weekly newsletters, or continual process changes throughout a year.

5. CONSISTENCY MAINTAINS YOUR MESSAGE

Your team pays as much or more attention to what you do as to what you say. Consistency in your leadership serves as a model for how they will behave. If you treat a meeting as unimportant, don't be surprised when you find they are doing the same to fellow teammates or even customers.

When something doesn't work, I look back at what happened and ask some serious questions. Did we shift gears too quickly? Did part of the team not deliver on a commitment? Or was the expected outcome off base from the start? Most of the time, the reason tracks back to lack of consistency.

There are a multitude of benefits that behaving in a constant manner will offer. Patterns are important to elevate your confidence, seeing as when you make a commitment to something and follow through, you learn to trust your intentions. Your reputation will also benefit from consistency because when your behaviors reflect your words and promises, people will trust what to expect from you. There is a saying, which reads, "your reputation precedes you." If you are known to follow through, people will appreciate that and remember you for it.

In business, your reputation is everything since referrals and recommendations can make or break a company. If someone is displeased with your service, they might take to any social media platform to discredit your brand. This is a legitimate concern, especially as social media continues to infiltrate every market.

If you think you need to work on your character, the first place to look is at the patterns of your actions. See if your behaviors and the words that you promise are consistent with one another. If they are not, you know the place you need to start working on. Only once this is recognized can you begin to enhance your disposition.

Consistency is key

Building Rapport

Monika Choudhary, HR & Admin



BUILD RAPPORT, STRENGTHEN THOSE BONDS AND GROW YOUR NETWORK.

"Rapport is the ability to enter someone else's world, to make him feel that you understand him, that you have a strong common bond." Tony Robbins.

ABOUT RAPPORT

The Merriam-Webster dictionary defines rapport as "relation characterized by harmony, conformity, accord, or affinity."

Put simply, you have rapport with someone when there is mutual liking and trust. Once you've established rapport with a person, he or she is far more likely to be open with you and share information, buy your product, recommend you to others, or support your ideas. And when someone has established rapport with you, you're likely to do the same.

WHY BUILD RAPPORT?

Building rapport is a skill that you can use anywhere.

For instance, you can use rapport to:

- Create a positive connection with new or existing team members
- Build good relationships with clients or suppliers
- Break the ice with new colleagues or with your boss when you start a new job
- Get support for your ideas and proposals

In short, establishing rapport with people can open doors, create opportunities and lead to excellent relationships.

HOW TO BUILD RAPPORT

We'll now look at strategies and techniques that you can use to build rapport with others.

1. Focus on Your Appearance

How you dress is a key component of making a great first impression and establishing rapport with someone. Your appearance should help you connect with people; not create a barrier.

For instance, imagine you're a sales rep calling on a plant supervisor. You're dressed in a well-tailored, expensive suit. Meanwhile, the supervisor has been working out on the floor all day; he's dressed in jeans, a worn flannel shirt, and work boots. The difference in your appearance is likely to make him feel uncomfortable and perhaps even slightly resentful.

A good rule of thumb is to dress just a little bit "better" than the people you're about to meet. Whenever possible, find out about this in advance. If you arrive and see that you're overdressed, you can quickly "dress down" by taking off your jacket or tie and by rolling up your shirt sleeves.

2. Don't Forget About the Basics

In developing rapport with others, you should also use the tried-and-true basics of good communication:

- Shaking hands firmly (in cultures where this is acceptable)
- Looking people in the eye
- Smiling
- Holding your head up and maintaining good posture
- Asking open-ended questions
- Being sincere
- Facing the other person instead of looking at your computer screen or mobile device

These basic tenets form the foundation of great communication, and it's hard to establish good rapport without them.

3. Find Common Ground

Think of how comfortable you might feel if, while living thousands of miles from where you grew up, you met someone from your hometown. That sense of connectedness creates an instant rapport between two people!

When you meet someone new, do your best to find something you have in common. Use open-ended questions to discover some personal information about the person: perhaps you attended the same school or university, have the same favorite vacation spot, grew up in the same city, know the same people, or root for the same sports team.

Remember, any common ground can help establish rapport-it can even help to have an interest in someone's life or hobbies, or to share similar beliefs and values.

Tip: It's important to be sincere here; don't make up an interest in something just to create rapport. Not only can this seem desperate; it can dent your credibility!

4. Be Empathic

Empathy is about understanding other people by seeing things from their perspective, and recognizing their emotions. Once you achieve this, it's easier to get "on their level."

To be more empathic, develop your emotional intelligence so that you can understand others better. You can also use Perceptual Positions-a technique for seeing things from other people's perspectives.

5. Use Mirroring

Mirroring is when you adjust your own body language and spoken language so that you "reflect" that of the person you're talking to.

SERIES 01

For example, law enforcement professionals apply the mirroring technique when interviewing witnesses, especially those who have been through a traumatic experience. They might mirror the victim's body language, and adjust the volume and tone of their voice to match the victim's.

To use mirroring:

- Carefully watch the person's body language, including gestures and posture. If the person is sitting down with both hands folded, then copy the person's posture. As the person grows more comfortable with you, he or she may relax and sit back: mirror this change in posture as well.
- Mirror the other person's language. If he or she uses simple, direct words, then you should too. If the person speaks in technical language, then match that style if appropriate. When you respond, you can also reiterate key words or phrases that he or she used.
- Copy the other person's speech patterns, such as vocal tone and volume.
For instance, if he or she speaks softly and slowly, then lower the volume and tempo of your voice. (Research by the U.S. Federal Bureau of Investigation (FBI) suggests this is the most effective way to establish rapport. It's very subtle, but it makes the other person feel comfortable and, most importantly, it makes them feel that they're being understood.)

Tip 1: While mirroring is useful in building rapport, don't match every word and gesture. Also, do this on a subtle level-being too overt can be counterproductive.

Tip 2: Clearly, mirroring can be a very difficult skill to master. Consider using role playing to practice it.

RE-ESTABLISHING RAPPORT

Once rapport has been lost, rebuilding it takes time.

First, confront why you lost the rapport in the first place. Be humble and explain honestly and simply what happened. If you need to apologize, do so.

Next, focus on ways of repairing any broken trust. Make an extra effort to put in extra work if you need to, and keep your word. Transparency and showing a genuine concern for the other person's needs will go a long way in rebuilding trust and reestablishing rapport.

KEY POINTS

You build rapport when you develop mutual trust, friendship, and affinity with someone.

Building rapport can be incredibly beneficial to your career-it opens doors and helps establish good relationships with clients, colleagues, and team members.

To build rapport, use the following strategies.

- Find common ground
- Focus on your appearance
- Be empathic
- Mirror the other person
- Don't forget about the basics

Tip 1: Although there will be times when you will need to build rapport with someone quickly, it's best done as part of a longer-term relationship.

Tip 2: It's important to use your best judgment when applying these techniques-as we've already mentioned, using these techniques incorrectly or dishonestly can actually stop you building rapport with people.

PROGRAMME YOUR PRESENT FOR THE BLISSFUL



Renuka Malhotra, Educator

There is no independent existence of the future. The future is the creation of our present. The seeds sown in the present determine the yield of the future.

Through the power of our imagination, we can easily transform our habits, nature, personality and quality of life as per our will. What we are today is the result of programming of our sub-conscious mind since past several lives. Likewise, our future will be framed the way we programme ourselves today.

We can inculcate new habits and qualities in our personality, accomplish impossible tasks, reverse the ageing process, become millionaire, create so many things, get charged with immense energy, live blissfully always, develop awareness in our life, fill our lives with love and remain unperturbed with joys and sorrows of life.

It is important to watch yourself throughout the day to see whether or not you are putting the seeds of positive and negative thoughts in your subconscious mind. Sowing the seeds of happiness means that all your day, whatever work you do, should be done gladly.

Any work done with annoyance, anger and disinterest leads to negative thoughts being sown. Therefore, if the present is full of happiness and heavenly, then our future also becomes happy.

The only way to make your present enjoyable is to do everything joyously, happily and with gratitude. If you succeed in living the life this way, your life will be full of bliss otherwise you will lose this opportunity.

It is your life & time; you are free to make it the way you wish it to be. If you miss this chance, nobody except you will be affected. So it is your wish to become aware or to remain ignorant, but the subconscious mind will continue to give positive & negative results depending on our thoughts.

SO GET CHARGED UP. PROGRAMME YOUR PRESENT TO MAKE HAPPY, BRIGHT AND BLISSFUL FUTURE.



Top 10 Benefits of Drinking Water

1. INCREASES ENERGY & RELIEVES FATIGUE

Since your brain is mostly water, drinking it helps you think, focus and concentrate better and be more alert. As an added bonus, your energy levels are also boosted!

2. PROMOTES WEIGHT LOSS

Removes by-products of fat, reduces eating intake (by filling up your tummy if consumed prior to meals), reduces hunger (hello natural appetite suppressant!), raises your metabolism and has zero calories!

3. FLUSHES OUT TOXINS

Gets rid of waste through sweat and urination which reduces the risk of kidney stones and UTI's (urinary tract infections).

4. IMPROVES SKIN COMPLEXION

Moisturizes your skin, keeps it fresh, soft, glowing and smooth. Gets rid of wrinkles. It's the best anti-aging treatment around!

5. MAINTAINS REGULARITY

Aids in digestion as water is essential to digest your food and prevents constipation.

6. BOOSTS IMMUNE SYSTEM

A water guzzler is less likely to get sick. And who wouldn't rather feel healthy the majority of the time? Drinking plenty of water helps fight against flu, cancer and other ailments like heart attacks.

7. NATURAL HEADACHE REMEDY

Helps relieve and prevent headaches (migraines & back pains too!) which are commonly caused by dehydration.

8. PREVENTS CRAMPS & SPRAINS

Proper hydration helps keep joints lubricated and muscles more elastic so joint pain is less likely.

9. PUTS YOU IN A GOOD MOOD

When the body is functioning at its best, you will feel great and be happy!

10. SAVE MONEY!

Water is FREE! Even if you choose bottled/filtered water, it's STILL cheaper than that high sugar and fat-filled latte!

EMPLOYEES ZONE



NAME : Akansha Sharma
DEPARTMENT : R&D Department
DATE of JOINING : February 16, 2016



NAME : Dr. Archana Prakash
DEPARTMENT : R&D Department
DATE of JOINING : March 2, 2016



NAME : Dinesh Sharma
DEPARTMENT : Business Development
DATE of JOINING : April 4, 2016

FUN ZONE

Spot the Difference

There are 10 differences in these pictures. Can you find them?

Send your entries at info@thecatalystsgroup.com to win gift.



Guess the Muhawaras

Guess the 12 muhawaras from the given emoticons/smiley/stickers/symbols and send your entries at info@thecatalystsgroup.com to win a gift.

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WHO WE ARE

Catalysts was established in 2003. Having its corporate office in the largest state of Uttar Pradesh in India and Manufacturing units in the Hill state of Uttarakhand. It is a leading research and quality certified Biotech company. We are engaged in delivering enzyme based eco-friendly solutions to many industry verticals. We are a multilevel quality certified company having certification of ISO 9001:2008, FSSC 22000 and HALAL.

Our Process expertise based enzyme formulation are a key competitive advantage for Catalysts and thus for our customers. We have a modern fully-equipped technology centre, where application research is done extensively using substrates received from client side.

Our technical team provides real time process and troubleshooting support to various industries like Molasses Ethanol, Grain Ethanol, Carbohydrates processing, Malt extraction, Brewing process and sugarcane juice processing.

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