SNS COLLEGE OF TECHNOLOGY
AN AUTONOMOUS INSTITUTION

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DEPARTMENT OF FOOD TECHNOLOGY

COURSE CODE & NAME: 19FTO301 BEVERAGE TECHNOLOGY
III YEAR / V SEMESTER

UNIT : I - INTRODUCTION TO BEVERAGES

TOPIC 1 : Beverage – Definition, Ingredients

Water

Water, as the main ingredient of a beverage, usually accounts between 85 -95% of the product and acts as a carrier for the other ingredients

Requirements:

Water quality

- High levels of elements and mineral salts
- Objectional tastes and odours
- Organic material

It should be

- Clear and colourless
- Free from dissolved oxygen
- Sterile,i.e. free from microorganisms

Quality of fresh water

- The quality of fresh water supplies will relate to the geological status of the catchment area
- In marshlands and peaty areas water may well be a pale yellow in colour and contain appreciable amounts of organic matter
- Such waters are sometimes termed humic (because the yellow colour derives from the humic and fulvic acids present) and are likely *to posses an unpleasant odour and bitter taste*

Water hardness

- The term hardness refers to the presence of calicum and magnesium salts
- Temporary hardness is due to the presence of bicarbonates of calcium and magesium
- Permanent hardness to calcium and magnesium chlorides,sulphates and nitrates

Total hardness:

The sum of temporary and permanent hardness

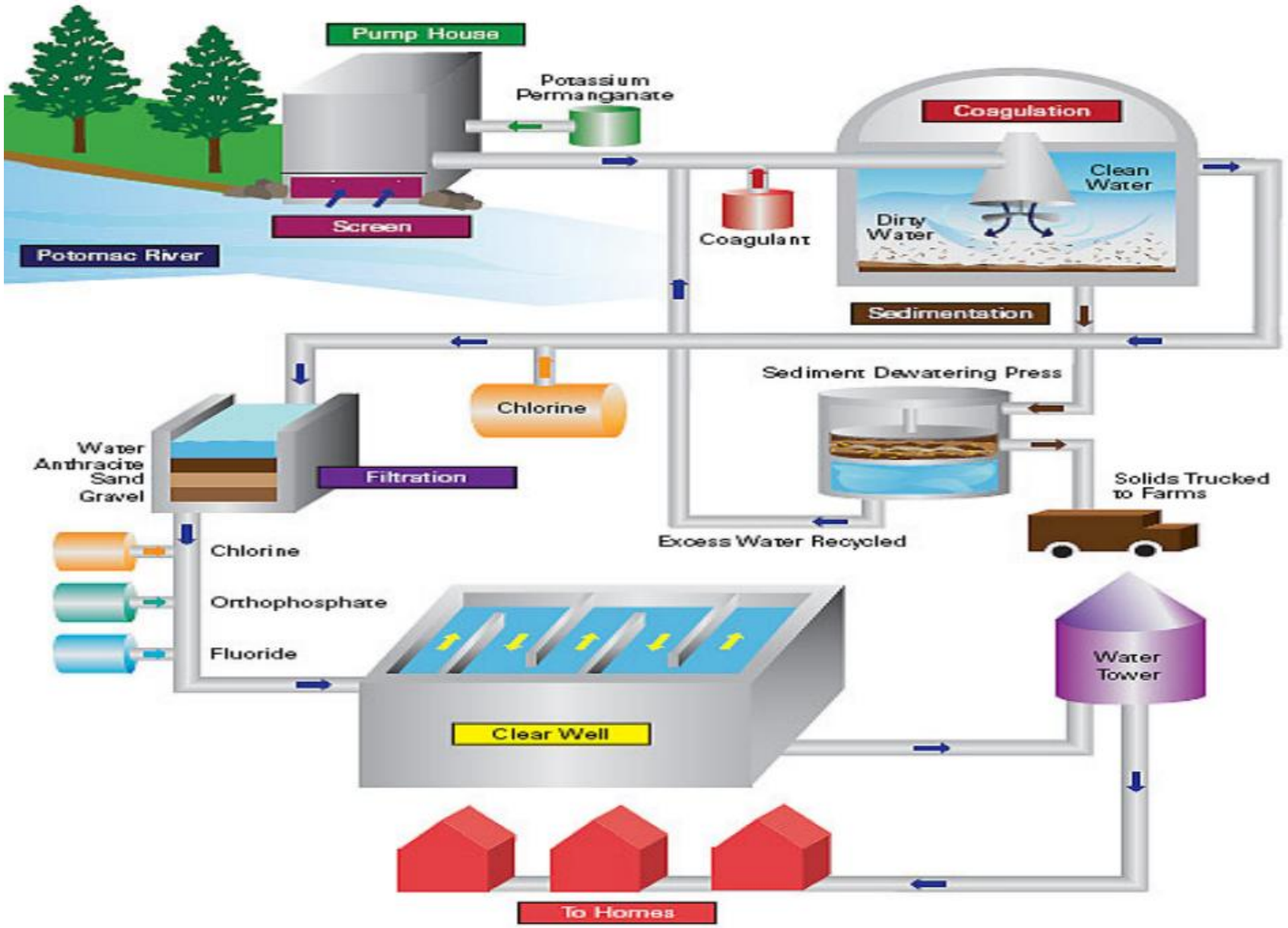
Approximate classifications are:

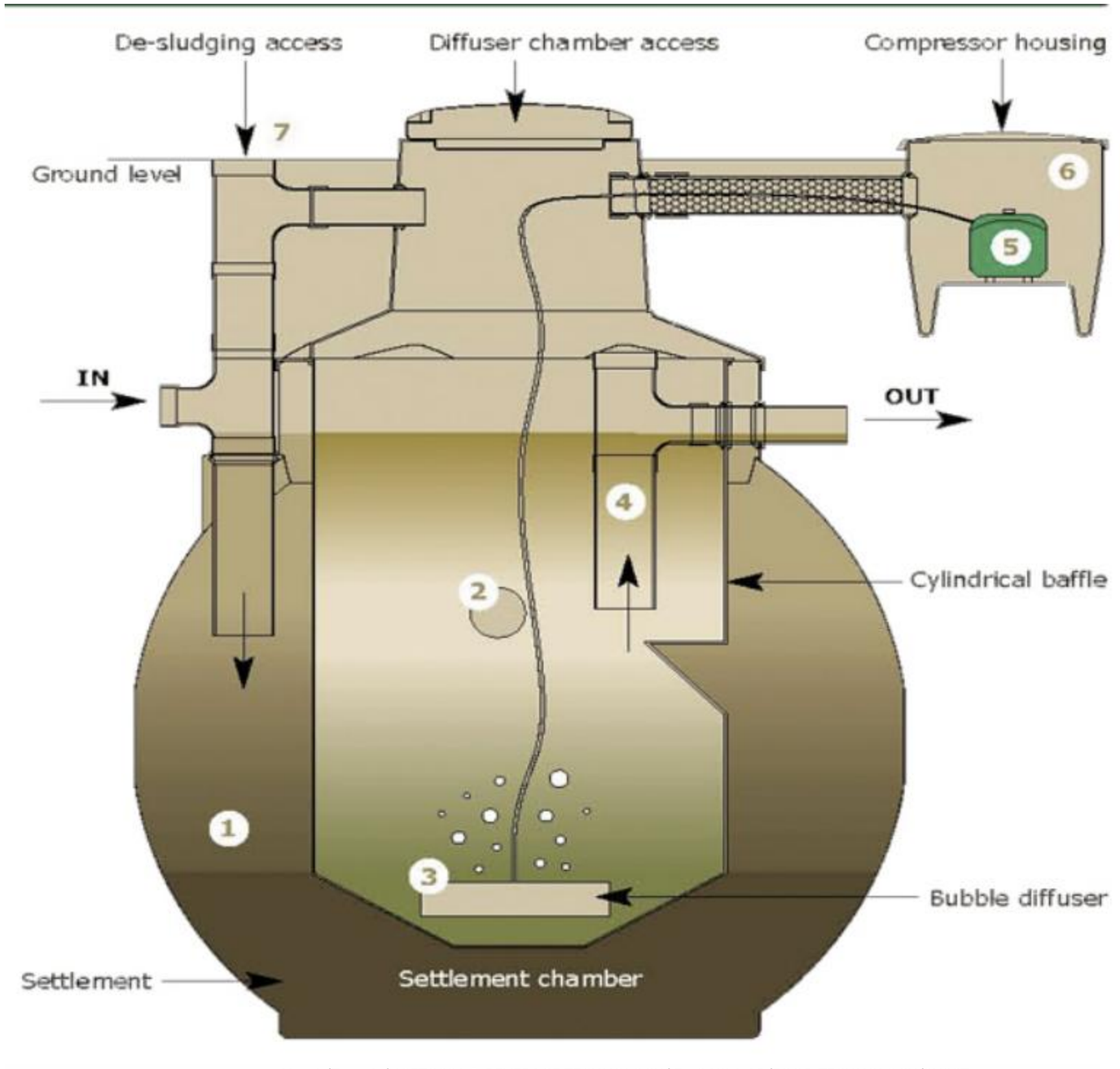
Soft < 50 mg\L as $CaCo_3$

Medium – soft 50-100 mg\L as $CaCo_3$

Hard 100-200 mg \ L as $CaCo_3$

Very hard 200- 350 mg \ L as $CaCo_3$


Pump House
Potassium Permanganate
Coagulation
Clean Water
Dirty Water
Coagulant
Screen
Potomac River
Sedimentation
Sediment Dewatering Press
Chlorine
Water
Anthracite
Sand
Gravel
Filtration
Solids Trucked to Farms
Excess Water Recycled
Chlorine
Orthophosphate
Fluoride
Water Tower
Clear Well
To Homes


De-sludging access
Diffuser chamber access
Compressor housing
7
Ground level
6
5
IN
OUT
4
Cylindrical baffle
2
1
3
Bubble diffuser
Settlement
Settlement chamber

Water treatment

The standard and well tried form of water purification involves treatment in a continuous manner with a coagulent (Al2$(SO_4)_3$,$Fe_2(SO_4)_3$ and chlorine together with lime to reduce the alkalinity as necessary

A gelatinous precipitate or floc forms(hydroxides of Al or Fe) which foreign organic matter.

- The chlorine sterilises the water by virtue of its microbiocidal and oxidising properties

- After treatment,the water is passed through a sand filter followed by an activated carbon filter,to remove traces of chlorine ,and then through a polishing filter(pore size less than 10 micrometer)

Water impurities and their effect

Suspended particles:

- Consists of complex inorganic hydroxides and silicates or organic debris
- Particles too small:
- Drink is carbonated – loss of carbonation ,foaming at the filler head,variable fill volumes
- Non-carbonated – visible deposits,neck –ring in the finished product

Organic matter:

The organic material – humic acid,algal poly saccharides,polypeptides,protozoa and microbial contamination

Result- precipitation and algal polysaccharides,respond to lower PH

High alkalinity:

- Due to –bicarbonates,carbonates and hydroxides and calcium,magnesium,sodium and potassium
- High alkalinity – buffer acidity – bland taste
- Reduced by coagulation or by ion exchange
- Creation of bland taste
- Below 50mg\l as $CaCo_3$

Nitrates:

The recommended limit for nitrate – 50 mg\l (WHO)

Sweeteners

1. Carbohydrate sweeteners
2. High intensity sweeteners

Carbohydrate sweeteners:

1. *Sucrose*
2. *Glucose*
3. *Fructose*

Sucrose is the organic compound commonly known as table sugar and sometimes called saccharose.

This white, odorless, crystalline powder has a pleasing,

sweet taste.

It is best known for its role in human nutrition.
The molecule is a disaccharide derived from glucose and fructose with the molecular formula $C_{12}H_{22}O_{11}$.
About 150,000,000 tonnes are produced annually.

Sucrose

Sucrose or ordinary sugar is the traditional sweetener used in beverages

Obtained –

Molecular structure – disaccharides

Glucose and fructose joined by glycosidic link

In acidic solution hydrolysis or inversion takes place at this linkage and the molecule break down into two components

Sweetness – alter slightly during storage of the drink - inversion taking place at low pH

So invert sugar used as popular alternative

Acidic or enzymic Hydrolysis – provides constant sweetness

Glucose

Glucose dervied from starch via acidic or enzymic hydrolysis
It is marketed in syrup form
Classed in terms of dextrose equivalent (DE) which signifies the degree of hydrolysis
DE = reducing sugar content, expressed as dextrose taken as a percentage of the total soluble solids

- The most widely used glucose syrups are 42 DE and 63 DE
- Relative sweetness 0.7 compared with sucrose
- Even high conc – less sweet
- DE reduces – viscosity of syrup rise- because of higher polysaccharides
- Low DE syrups – contribute mouthfeel to the drink

Fructose:

- **Sometimes known as fruit sugar**
- Manufactured by isolation of fructose from invert sugar or high fructose glucose syrup
- The relative sweetness of fructose about 1.3 times that of sucrose
- In cold acidic solutions fructose is sweetest and it can enhance fruit flavours, making them taste fruitier and more refreshing
- Used in combination with other sweeteners – reduce the bitter after taste of high intensity sweeteners

Fructose finds use in sports drinks and in reduced sugar and low calorie drinks

High – intensity sweeteners:

1. Saccharin
2. Aspartame
3. Ace sulfame – K
4. Cyclamic acid
5. Neohesperidin dihydrochalcone

Saccharin

- This substance is approximately 300 times sweeter than sucrose.
- Saccharin in tablet form
- It is one of the cheapest sweeteners in use ,has good stability,excellent shelf life and works well in combination with other sweeteners
- It has an sweet taste but suffers the disadvantage of a bitter metallic aftertaste
- And sparingly soluble and is normally introduced to a beverage formulation as either its sodium or calcium salt

- The solubilities of sodium saccharin,calcium saccharin and saccharin itself 80 g\ 100 ml, 40 g\ ml, 0.3 g / 100 ml
- Saccharin is widely permitted in soft drinks
- EC Directive permits its use at 80 mg \l in energy reduced \ sugar – free – water / dairy / fruit based drinks

Aspartame

- Aspartame is 200 times sweeter than sucrose
- It was first officially permitted in the US and UK in 1983
- The optimum pH range of aspartame stability occurring at pH 4.3
- Aspartame is a dipeptide of aspartic acid and phenyalaine and on hydrolysis in high- acid drinks it slowly reverts to these two source materials – gradual loss

- so usually used in combination with either saccharin or acesulfame – K
- And this result in acceptable sweetness with improved shelf life
- Approved for use in US and Europe

Today it is permitted by the EU Directive in energy – reduced/no added sugar – water \dairy\fruit based to a maximum level of 600 mg \ l

Acesulfame K:

- Acesulfame – K is 150 – 200 times sweeter than sucrose,but it lacks fullness and exhibits a lingering bitter aftertaste that is particularly noticeable at higher concentrations
- Under similar conditions – acesulfame – k need to be introduced at the level of 600-700 mg\l
- The EC Directive permits – in energy reduced\no added sugar-water/dairy\ fruit based drinks to a maximum level of 350 mg /litre

Cyclamic acid:

Cyclamic acid is about 30 times sweeter than sucrose and is used mainly as the sodium salt because of the advantage of its solubility – 200 g\l at 20^0 c

It was employed to good effect in combination with saccharin for low – calorie soft drinks

Permits use of cyclamic acid,and its sodium and calcium salts (E952), in energy – reduced \ no added sugar- water \dairy\ fruit based drinks to a maximum level to400 mg\l

Neohespirdin dihydrochalcone:

- On average it is considered to be 900 times sweeter than sucrose
- A flavanone obtained from bitter organges
- It operates best in combination with other sweeteners and also contributes as a flavour enhancer and flavour modifier

The EC permits use of NHDC(E959) in energy reduce/no added sugar – water /fruit based drinks to a limit of 30 g \l and in dairy – based drinks up to 50 mg\l

THANKYOU