Sugar syrup preparation

- ✓ Prepared at a concentration of 65–70%,
- ✓ Filtered and stored in a tank,
- ✓ Used from this tank as required.

Sugar syrup preparation

- **Sugar table** prepared for this purpose is used, (experimentally prepared)
- **The density of sugar** is used.

Reconstitution of fruit juices

- **Volumes** are usually used in the production plants. **However, all mass balance calculations must be based on the mass.**
- To calculate the **volume** of juice, pulp or concentrates, the **density** of juice, pulp or concentrate is needed.
- Densities of juices and pulps are given in Table 2.
- For the density of juice concentrates, Table 1 for sugar syrups is used.

- **Example 12:** For the preparation of 500 L of sugar syrup with 66% sucrose, calculate the mass of sugar and water, and the mass of sugar solution obtained.

Answers

- X = **436.4 kg of sugar** needed
- Y = **224.8 L of water** needed
- W_{syrup} = **661.2 kg**

- **Example 13:** Solve the example 12 by using the density of sucrose 1.61 g/mL and not using sugar syrup table. Find out the density of sugar syrup obtained as "kg/L."

Answers

- X = **440 kg of sugar**
- Y = **226.7 kg of water**
- $W_{\text{sugar syrup}}$ = **666.7 kg of sugar syrup**
- $\rho_{\text{sugar syrup}}$ = **1.3334 kg/L**

The amounts of water and sugar contents prepared by taking into consideration of the density of sucrose are little higher than those obtained from sugar syrup table.

Since the values in sugar syrup table are obtained from the experimental values, these values are more accurate than the ones calculated from the density of sucrose.

- **Example 14:** Sugar is added to the 750 L of water to prepare sugar syrup with 66% sucrose. Calculate the mass of sugar and, the mass and volume of sugar solution obtained.

Answers

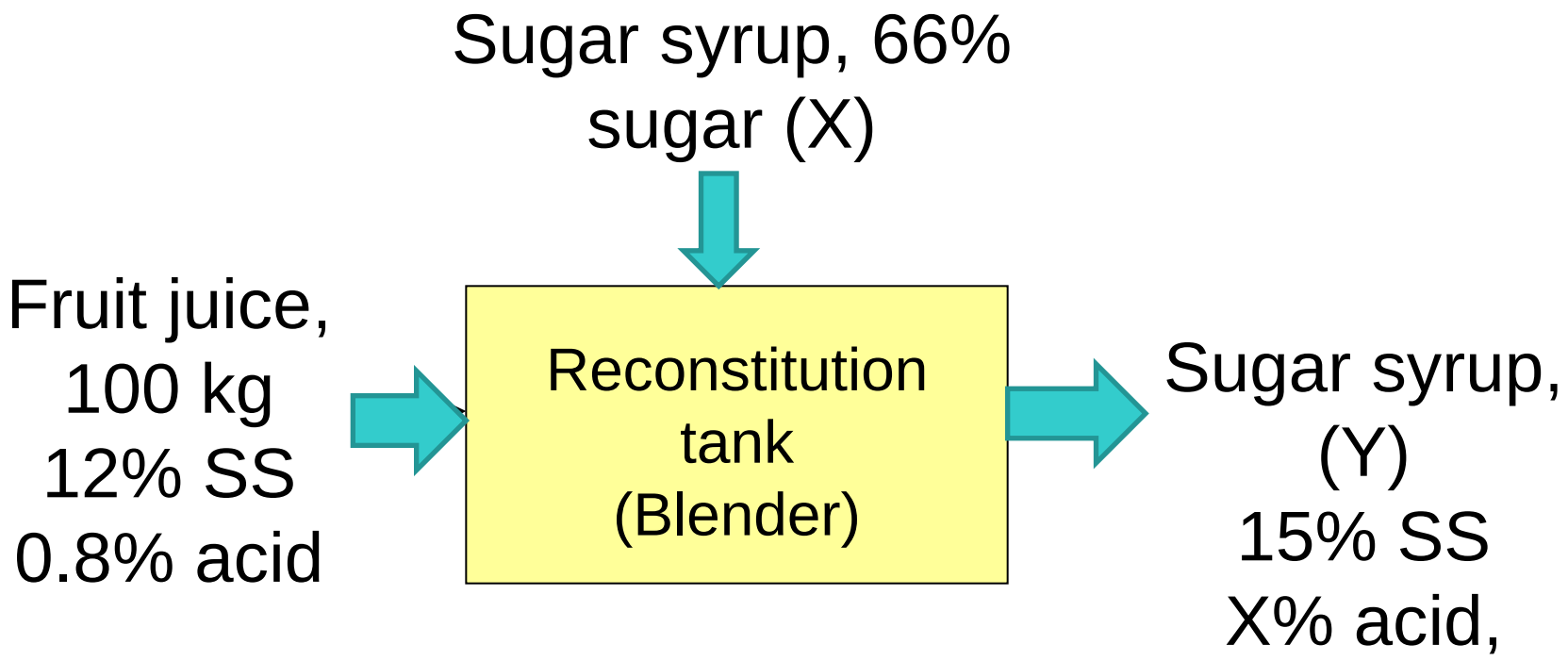
- X = **1455.98 kg of sugar**
- Y = **1668.15 L of sugar syrup**

- **Example 3.13:** Solve the example 13 by using the density of sucrose 1.61 g/mL and not using sugar syrup table. Find out the density of sugar syrup obtained as "kg/L."

- **Example 3.15**: The fruit juice is reconstituted by blending sugar syrup at 66% sugar content with fruit juice at 12% soluble solid and 0.8% acid content. The final soluble solid content of reconstituted juice will be 15%. Calculate the weight of sugar syrup added and the final acid concentration of reconstituted juice.

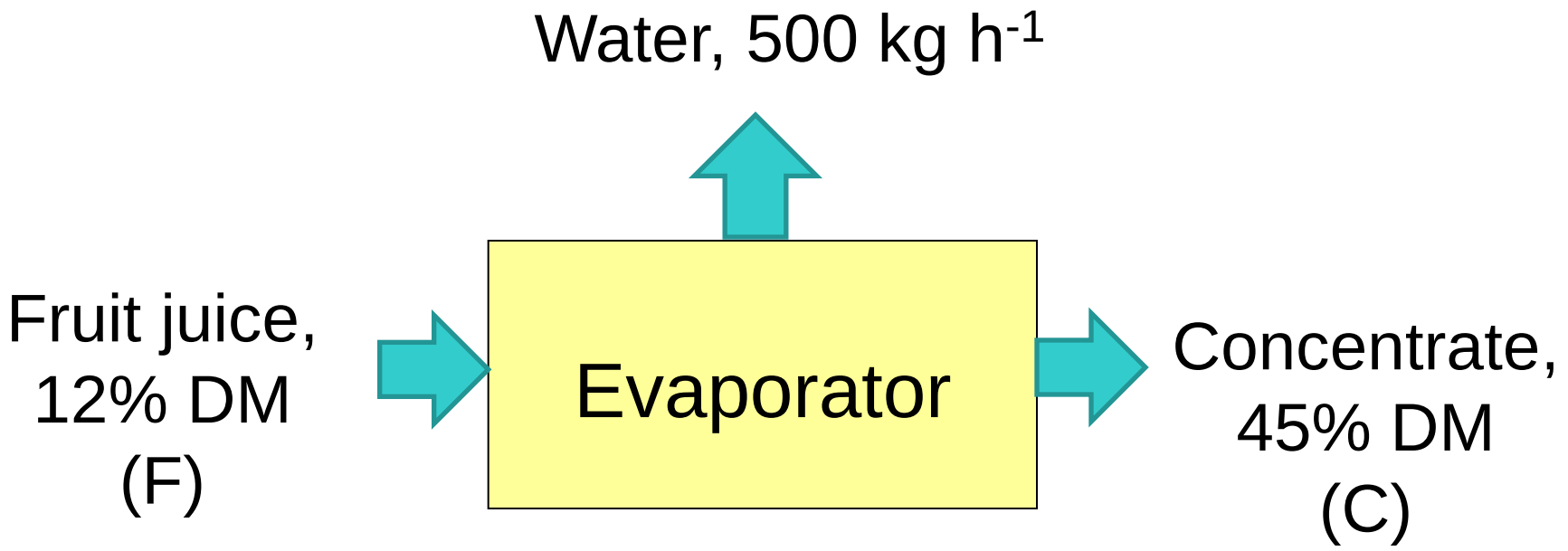
- **Example 6:** The brix of fruit juice containing 12% soluble solid and 0.8% acid was reconstituted to 15% by adding sugar syrup with 66% sugar content. Find out the weight of syrup and the mass percentage of acid content of reconstituted juice

The reconstitution of fruit juice with sugar syrup



- **Example 7**: 500 kg of water is removed in an evaporator at each hour. Fruit juice with 12% soluble solid content enters the evaporator and leaves the system as concentrate with 45% solid. Find out the concentrate production rate.

Flow diagram for concentration of fruit juice



- **Example 8:** 25 kg of sugar syrup with 66% sugar content is diluted with water. The diluted syrup contains 11% sugar. Find out the weight of diluted syrup using mass fraction.

- **Example 9 :** Find out the mass of sucrose crystals after cooling of 100 kg sugar solution with 75% sucrose content to 15°C. Sucrose solution at 15°C contains 66% sucrose. Calculate the mass of syrup after cooling.

- **Example10 :** In a crystal sugar producing plant, the sugar crystals is obtained from 100 kg of a concentrated sugar solution containing 85% sucrose and 1% inert, i.e., water-soluble impurities. Upon cooling, the sugar crystallizes from solution. A centrifuge then separates the crystals from a liquid fraction called the mother liquor. The mother liquor leaving the centrifuge contains 60% sucrose by weight. The crystal slurry fraction has, for 20% of its weight, a liquid with the same composition as the mother liquor. Find out the mass of the crystals and concentrated sugar solution.

Answers

C = 78.125 kg wet crystals

M = 21.875 kg mother liquid

- **Example 11**: Calculate the mass of beef and back fat (iç yağı) for the preparation of 100 kg of sausage. The beef contains 15% protein, 20% fat, and 63% water, and back fat contains 3% protein, 80% fat and 15% water. The sausage contains 25% fat.

Answers

B = 8.33 kg back fat

P = 91.67 kg beef

Material balance calculations in the preparation of fruit juice and nectars

For some fruit juice and pulps;

In natural state; they are not **drinkable due to:**

- Composition; for example, insufficient acidity (apricot) or too much acidity (sour cherry), and intense aroma (mango),
- Physical state; for example, viscous (apricot and peach),

To brink drinkable state;

Add one or more of the following;

- water,
- sugar,
- acid.

The fruit drinks prepared that way cannot be called as **“fruit juice”** but called as **“nectar” (fruit content 25-99%) or “fruit drink” (fruit content 1-24%)**

Reconstitution of fruit juice;

- Fruit juices are processed in concentrate and then stored.

- Then, they are processed in nectars (sour cherry) or fruit juice (apple).

- The dilution of concentrates with water to their original brix is called as reconstitution. Final product is still **fruit juice**.

- However, the addition of water, sugar and acid to fruit juices to bring the fruit juice to the drinkable state is also called as reconstitution. Final product is still **nectar**.

- **Water:** demineralized water or at least the drinkable water

- **Sugar:**
  - Crystal sugar,
  - Sugar syrup, 65^{o}-70^{o}Brix (recommended)

- **Acid:**
  - crystal
  - 50% solution (recommended)