

Q.1 Fresh orange juice contains 12 wt% solids and balance water, and concentrated orange juice contains 42 wt% solids. Initially a single evaporation process was used for the concentration, but volatile constituents of the juice escaped with the water, leaving the concentrate with a flat taste. The current process overcomes this problem by bypassing the evaporator with a fraction of the fresh juice. The juice that enters the evaporator is concentrated to 58 wt% solids, and the evaporator product stream is mixed with the bypassed fresh juice to achieve the desired final concentration. Calculate the amount of product (42% concentrate) produced per 100 kg of fresh juice fed to the process, and the fraction of feed that bypasses the evaporator.

Q.2 The diagram of a shirt cleaning process is shown below. The shirts are soaked in an agitating tub containing Whizzo, the wonder detergent, and are then wrung out and sent to a rinse stage. The dirty Whizzo is sent to a filter in which most of the dirt is removed, and the cleaned detergent is recycled back to join a stream of fresh Whizzo.

Data: Each 100 kg of dirty shirts contain 2 kg of dirt. The washing removes 95% of the dirt. For each 100 kg of dirty shirts, 25 kg of Whizoo leaves with the clean shirts, of which 22 kg is wrung back to the tub. The detergent that enters the tub contains 97% Whizzoo, and that which enters the filter contains 87%. The wet dirt that leaves the filter contains 8% Whizoo.

Calculate: (a) How much pure Whizoo must be supplied per 100 kg of dirty shirt?
(b) What is the composition of the recycled stream?

