UNIT 1 PUZZLES (PART II)

SUB: PHARMACEUTICAL ENGINEERING

Puzzle 6: Choosing the Right Mill for a Pharmaceutical Application
A pharmaceutical company needs to reduce the particle size of a heat-sensitive active ingredient for tablet formulation. They are considering using either a Ball mill or a Fluid energy mill. The ingredient is expensive, and minimizing material loss is critical.

Question:
Compare the working principles, merits, and demerits of the Ball mill and Fluid energy mill. Which mill would you recommend for this heat-sensitive material, and why?

Key Concepts Tested: Principles, construction, working, merits, and demerits of Ball mill and Fluid energy mill.

Puzzle 7: Edge Runner Mill vs. End Runner Mill in Herbal Processing
A herbal medicine manufacturer uses an Edge runner mill to process tough, fibrous plant material. However, the output particle size is inconsistent, and the mill requires frequent maintenance. The company is considering switching to an End runner mill to improve efficiency.

Question:
What are the key differences in the working principles and construction of the Edge runner mill and End runner mill? Evaluate their merits and demerits for processing fibrous plant material and recommend the better option.

Key Concepts Tested: Principles, construction, working, merits, and demerits of Edge runner mill and End runner mill.

Size Separation

Puzzle 8: Sieve Shaker Failure in a Quality Control Lab
A quality control laboratory uses a Sieve shaker to separate powder samples into different size fractions for analysis. During a batch test, the sieve shaker produces inconsistent results, with some finer particles appearing in the coarser fraction. The lab technician suspects that the sieve mesh may be damaged or that the shaking mechanism is faulty.

Question:
What could be causing the inconsistent size separation in the Sieve shaker? Discuss the principles of size separation and suggest maintenance or operational changes to improve the accuracy of the results.

Key Concepts Tested: Size separation principles, Sieve shaker construction, working, and operational challenges.

Puzzle 9: Cyclone Separator Underperformance in a Cement Plant

A cement manufacturing plant uses a Cyclone separator to remove fine dust particles from exhaust gases. Recently, the separator's efficiency has decreased, leading to higher dust emissions. The plant manager notes that the inlet velocity of the gas stream has increased due to a process change.

Question:

How does the inlet velocity affect the performance of a Cyclone separator? Explain the mechanism of size separation in a Cyclone separator and propose adjustments to restore its efficiency.

Key Concepts Tested: Mechanism of size separation, Cyclone separator working principle, factors affecting performance.

Puzzle 10: Bag Filter Clogging in a Chemical Processing Unit

A chemical processing unit uses a Bag filter to capture fine particles from a gas stream. Over time, the filter bags become clogged, reducing airflow and causing production delays. The particles being filtered are sticky and tend to adhere to the filter material.

Question:

What factors might contribute to the clogging of the Bag filter? Discuss the working principle of a Bag filter and suggest modifications to the system or maintenance practices to prevent clogging.

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Key Concepts :Tested Bag filter working principle, size separation mechanism, operational challenges.