

LOWPREP



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SOLINAS

PRODUCT DESIGN CHALLENGE



Problem Statement

Design of a telescopic shaft for 5 m depth

A team of engineers is currently dedicated to the task of homogenizing solid material or waste with liquid substances like water or wastewater. Their goal is to create a pumpable slurry, utilizing an agitator mechanism featuring a motor, solid shaft, and blades at its tip. The main challenge they face is related to the tank's depth, which reaches 5 meters. The significant hurdle revolves around the solid shaft's lack of flexibility and its considerable weight. The team actively seeks an innovative solution, particularly a shaft capable of retracting to a length of 1 meter and effortlessly extending to depths of 5 meters. This compact and inventive shaft would empower the team to effectively blend waste within these deep tanks.

Could you design a shaft capable of expanding up to 5 meters and retracting to 1 meter without affecting other components? Consider the diameter of the tank is 0.4 m and depth is 5 m. Additionally, it should be easily portable by humans and suitable for immersion in underwater or sludge storage tanks of 5 meters in depth. Consider waterproofing and spark-proofing for the shaft in the given environment. Furthermore, ensure that the expansion and retraction processes are user-friendly, requiring just a single switch or button for operation.



Evaluation

Submission Deadline: **15th December**

1. Depth Capability (20 points):
 - a. Award points based on the shaft's ability to smoothly and reliably extend to the full depth of 5 meters and retract to 1.
2. Flexibility and Weight (15 points):
 - a. Assess the shaft's flexibility to ensure that it accommodates the challenging depth without compromising on structural integrity.
 - b. Consider the weight of the shaft and its impact on portability; lighter shaft should be scored higher.
3. User-Friendliness (10 points):
 - a. Evaluate the ease of operation, focusing on the simplicity of the single switch or button control for both expansion and retraction.
4. Waterproofing (10 points):
 - a. Check the effectiveness of waterproofing measures to protect the shaft in underwater or sludge storage tank environments.
 - b. Ensure the design incorporates spark-proofing features for safety in potentially hazardous conditions.
5. Portability (15 points):
 - a. Assess the shaft's portability, considering the ease with which it can be handled and transported manually.
6. Design (30 points):
 - a. To assess the full working assembly and part design.