

## Background & Objective

Conventional drilling mud management is slow and manual, leading to delays, poor control, increased NPT, and safety risks. This project develops an Intelligent Drilling Mud Management System (IDMMS) for real-time monitoring and automated control using sensors, AI, and additive dosing.

## Constraints

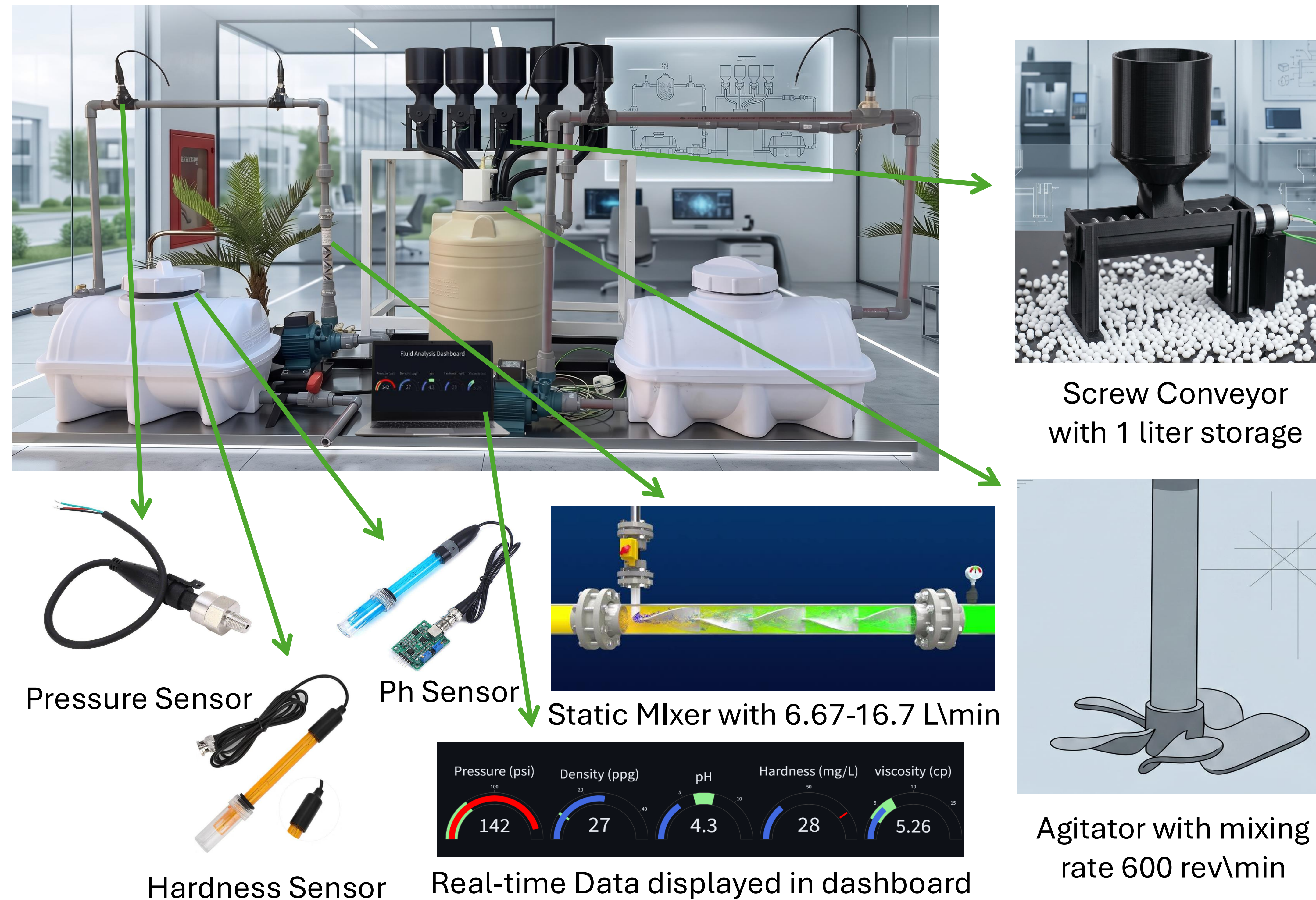
The system shall maintain a minimum flowrate of 10 L/min for screen performance.

Rheology sensing module shall estimate rheological properties with  $\pm 10\%$  accuracy.

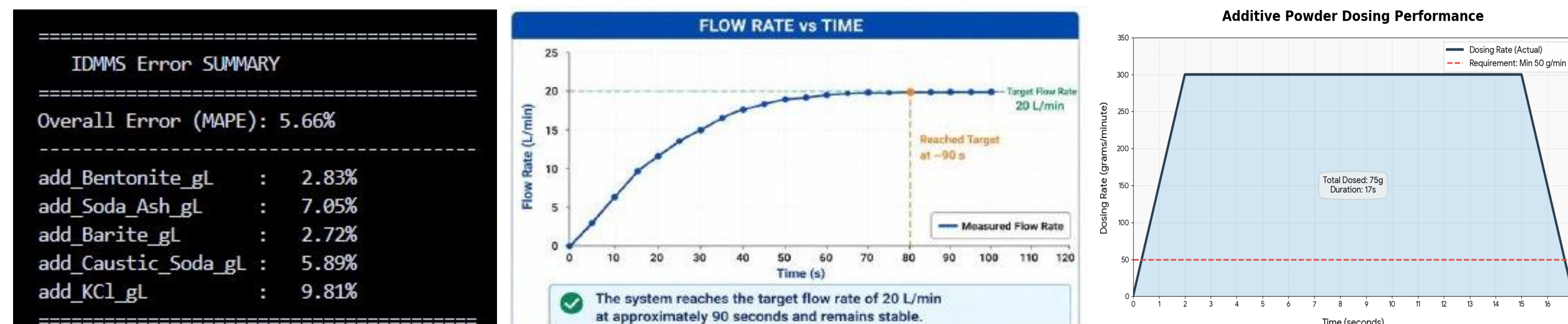
Additives handling unit shall operate reliably with particles size  $\leq 500 \mu\text{m}$  without clogging.

The system must enable zero human-additive contact during mud stabilization.

## System Design & Workflow



## Testing & Validation



## Specifications

Sensor data latency & report $\leq 8$ seconds	Additive dosing accuracy within $\pm 10\%$
Flow rate $\geq 10$ L/min	AI model training loss $\leq 0.20$
Solid dosing resolution $\geq 25$ g/min	End-to-end response time $\geq 15\%$ faster
6 storage cells for different additives	Maximum energy use of 135 Watts
Adjustable user approval within 3 minutes	Congestion classification $\geq 80\%$ accuracy

## Conclusions & Future Work

The IDMMS enhances efficiency, accuracy, and safety through real-time automated mud control, reducing non-productive time (NPT) and integrating sensing, AI, and dosing. Future work includes using real data, enabling fully accurate closed-loop control.