

Performance evaluation of a <37kW category loader backhoe in stockpile operation

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Loader backhoe, a widely used construction equipment in India must be Stage-IV diesel emission compliant from March'2021 onwards. However, Stage-IV engines are known to be expensive and less fuel efficient. In addition to upgrading vehicles to Stage-IV, a sustainable solution could be to have an offering in <37kW engine category as it remains unchanged and Stage-III emission norms are applied. This machine can be made at a lesser cost and could be more fuel efficient.

Challenge is to achieve a performance acceptable to customer especially in loader operation. An advanced hydraulic control architecture incorporating EH pump and an electronic controller are proposed. Simulation is carried in SimulationX environment to understand the system interactions, evaluate controller logic, and conduct iterations to finalize best possible outcome for physical tests.

Scope of simulation is limited to only that phase of stockpile operation wherein loader enters pile of dirt and bucket is loaded. Model is first prepared for baseline Stage-IV machine and refined after comparing simulation results with those from physical tests. Next, a model is prepared for the new system of <37kW machine.

Results are compared within different iterations and the best logic and settings are selected for physical trials. Initial results from the prototype are promising. Future work entails comparing results from prototype and scope of further optimization.