

Title: Performance Evaluation and Energy Optimization of Centrifugal Pumps for Agricultural Water Systems in Pakistan

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INTRODUCTION

- Pakistan's agriculture is facing dual challenges of water scarcity and energy costs.
- Inefficient groundwater pumping systems waste significant energy resources.

OBJECTIVES

- Evaluate hydraulic performance of local centrifugal pumps.
- Quantify energy efficiency and hydraulic losses.
- Recommend optimization strategies for sustainable irrigation.

METHOD

- Field and lab testing conducted at Golden Pumps Pvt. Ltd., Gujranwala.
- Eight centrifugal pumps with impeller diameters between 180–222 mm.
- Measured discharge, head, and power input at various speeds.
- Calculated efficiency and head losses through fittings (bends, reducers, valves).

DISCUSSION

- Proper pump selection improves the irrigation efficiency.
- Optimized sizing and performance monitoring can reduce the energy waste in agriculture
- Results supports the sustainable water energy management

CONCLUSION

- Optimized pump selection can save up to one-third of energy use.
- Head losses in fittings (bends, reducers, check valves) are significant.
- Performance monitoring and matching motor impeller pairs improve sustainability.

FUTURE WORK

- Integration of smart sensors for real-time pump monitoring.
- AI-based pump selection models for localized conditions.
- Renewable energy (solar-powered) pumping integration.

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RESULTS

Fig. 1. Head-Discharge (H-Q) Curves

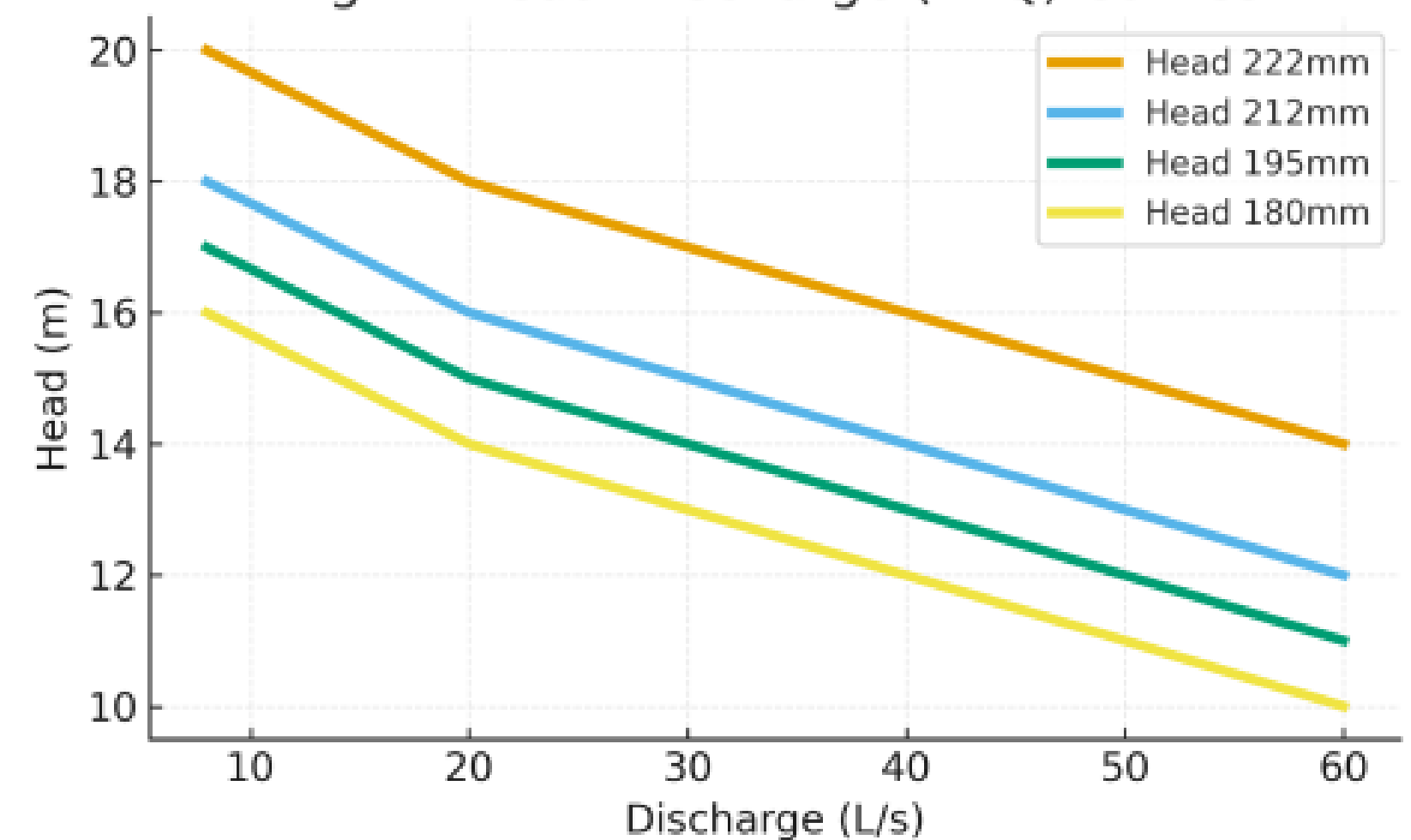


Fig. 2. Efficiency vs. Impeller Diameter

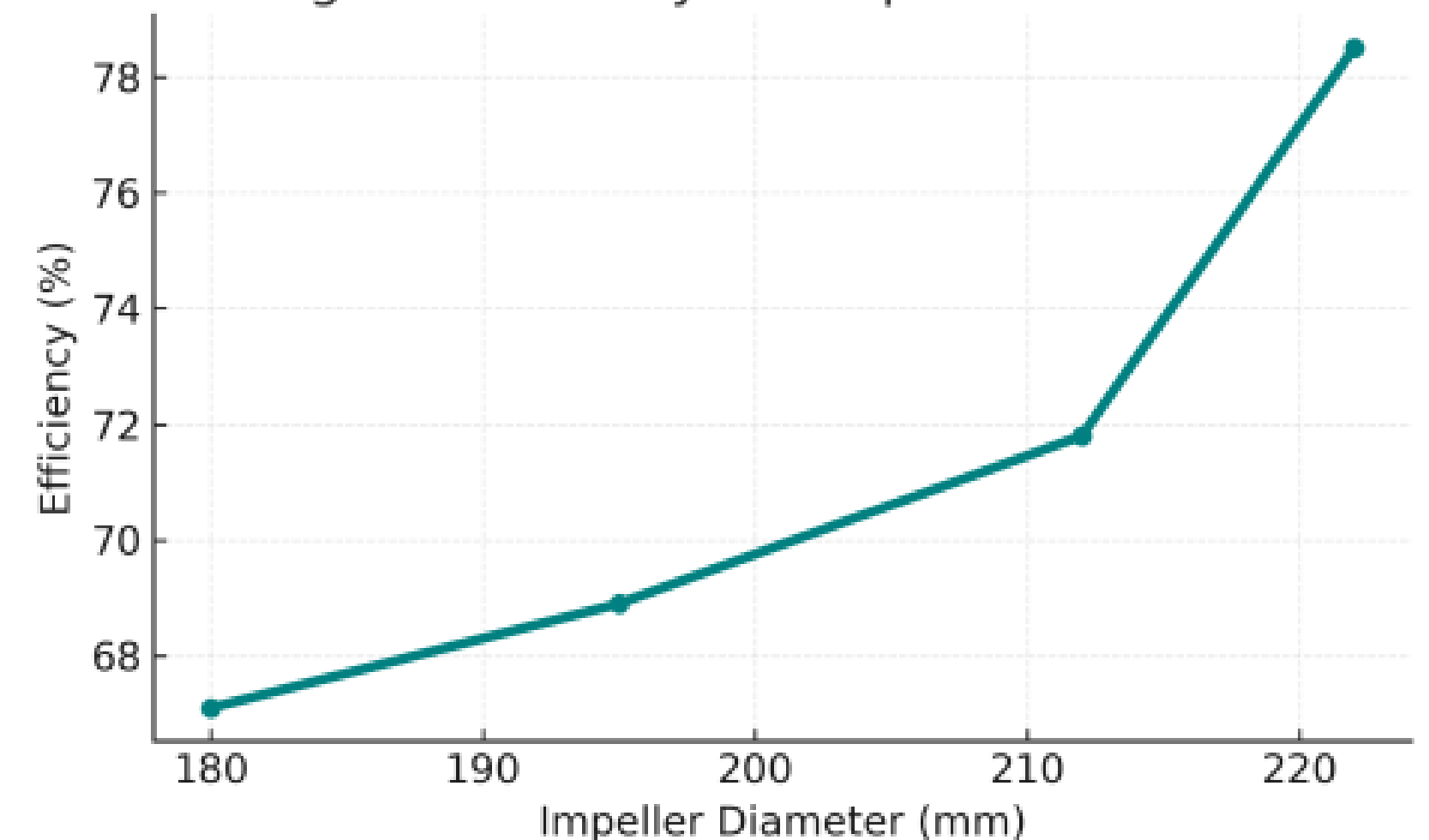
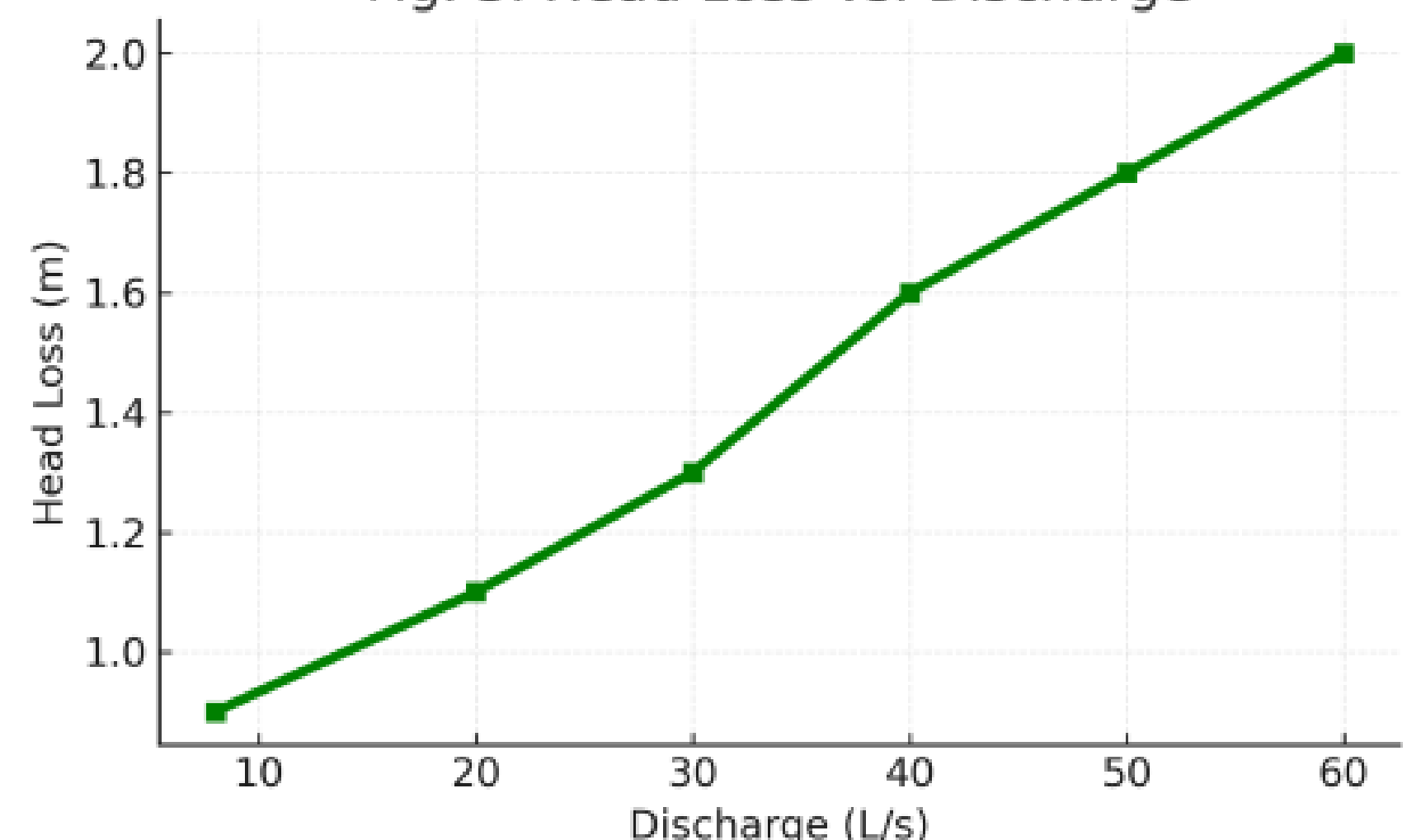


Fig. 3. Head Loss vs. Discharge



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