

The Axial Flow and Mixed Flow Pumps for Surface Water Irrigation, Drainage and Fisheries



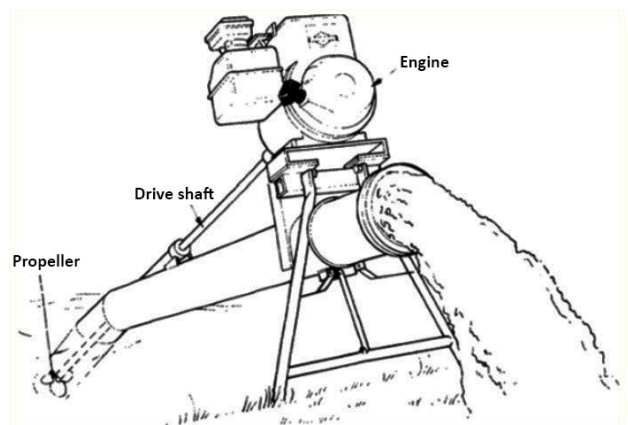
Axial flow and mixed flow pumps (AFPs and MFPs) are energy saving technologies for small-farm irrigation, whose development dates back to the 1960s in Vietnam and Thailand. Today, more than 1.5 million of these are used across East and Southeast Asia, serving as an energy-efficient and economically-viable alternative to traditional centrifugal pumps, especially in light of rising fuel costs and an increasing focus on utilizing surface water for irrigation in South Asia.

HOW DO AXIAL FLOW AND MIXED FLOW PUMPS WORK?

They are widely referred to as ‘propeller pumps’ on account of their simple design and construction, which is basically a boat propeller inside a pipe. The pumps are easily powered with the engine of a two-wheel tractor, mini-tiller (power weeder) or stationary engines and electric motors. They can also be powered directly by V-belts to external engines/motors as well as with engines/motors mounted to the pump via direct coupling.

Different models have different lengths, widths, horsepower and RPM (revolutions per minute) requirements. AFP/MFPs driven by petrol and smaller high-speed diesel engines have a higher maximum RPM (1800-2400 RPM) whereas those designed to be driven by larger and lower-speed diesel engines and electric motors generally have lower RPM requirements (900 -1500 RPM).

The AFP/MFP is self-priming but its intake-impeller must be completely submerged. There are many models with different designs. Most ‘Thai’ models have the impeller’s drive-shaft running through the center of the delivery pipe. Other models may have these shafts on the outside of the pipe with the appropriate safety measures for rotating shafts and open belts.



AFP with external drive shaft and engine mounted to the pump

AFPs/MFPs help save over 50% in fuel costs , which is the primary cost of irrigation



A two-wheel tractor (power tiller) powering an AFP with internal drive shaft using long V belts

COST BENEFITS AND SPECIFICATIONS

While the initial cost of the AFP/MFP is 2-3 times higher than a centrifugal pump, their water discharge (within 3-9 feet lift height) can be more than double, using the same engine or motor. This results in enough fuel/energy savings to recover the initial added cost of the AFP/MFP in a single season. Further, when used for freshwater fisheries, drainage or irrigation, conventional steel sheets can be used keeping pump costs at approximately INR 13,000-20,000 depending on make, model and size. But if used for saltwater fisheries, AFP construction can require stainless steel that will increase the pump cost.

The pumps are used in low lift situations usually from open water sources. AFPs can usually lift water of maximum height at 3 meters and MFPs at about 5 meters, but there are some models available that can lift higher. The buyer must make sure to match the pump's water lift or height requirement with the engine horsepower (HP) and its RPM. RPM can also be adjusted by selecting the correct drive and driven pulley size. Larger pumps above 5-6 HP may need two V-belts to prevent belt slippage.

Long AFPs are not necessarily designed to increase depth of water lift but have been developed so that the engine powering the pump can be safely set up on the bank of a canal, river or pond with less risk of falling into the water. Weighing less than 40 kilograms, AFPs usually have a carrying handle at each end of the pump and can easily be carried by two people.

IMPORTANT TIPS FOR SAFE USE

- 1) The pump's bushings and bearings can be damaged by dirty water and weeds, plastic and cloth caught in the impeller blades. Care must be taken to keep the intake screen and blades clean and to keep the pump at least 12 inches off the bottom to reduce suction of sand, silt and trash into the pump.
- 2) Continued V-belt slippage causes friction heat and damage to the belts and even the pump's pulley bearings. Care must be taken to have correct V-belt tightness to stop slippage.
- 3) As with other pumps, do not run the pump dry (out of the water).
- 4) Operators must take special care of their hands, hair and clothes around open V-belts, couplings and shafts.
- 5) If electric motors are used, proper grounding should be ensured to prevent electrocution.
- 6) Children should not be allowed to come close to the pump while it is in operation.
- 7) Carefully read the manufacturer's manual before operation.