

TITLE: Constant Circulation Water Pump

SPONSOR: Master Spas

### Proposal/Scope

Providing 24-hour water circulation in a hot tub offers several advantages:

- Ensures that sanitizers (such as chlorine) are evenly dispersed throughout the entire volume of water for the most effective disinfection and bather safety.
- Draws more water through the filtration system to minimize buildup of debris and particulates.
- Keeps water temperature more consistent and reduces thermal stratification.

A small, dedicated pump is required to provide 24-hour water circulation in a hot tub. There are several challenges that must be overcome for the pump to be practical:

- The pump must have extremely low energy usage to minimize the electricity cost impact for the consumer and meet stringent energy consumption regulations.
- The pump must generate enough force to overcome hydrostatic pressure and enough flow to provide a meaningful number of water turns per day.
- The pump's always-on, continuous duty operation means it will encounter its MTBF (Mean Time Between Failure) rating faster, leading to replacement every few years. If the pump lifespan cannot be increased, then a quick and easy replacement method must be invented.
- The pump increases the initial purchase price of the hot tub (in addition to the frequent replacement cost described above). The cost must be as low as possible to maintain affordability for the consumer.
- The pump must provide quiet operation, so its continuous operation will not create a noise disturbance for the consumer.

Budget: \$10,000