



Griswold Water Systems Guidelines: Power Factor or Power Efficiency

Several Reps have expressed interest in using Power Factor or Power Efficiency as a “Spec Stopper” in competing with the Dolphin or Pulse~Pure. The question arises: is the Wave’s favorable Power Factor a minor or significant advantage to the customer? I have come to believe it provides a significant advantage.

The issue is all about the Power Factor (PF) as a measure of the efficient use of electricity. PF can be between 0 and 1; a PF of 0 means that all the power supplied is wasted while a PF of 1 means that no power is wasted. Typical large commercial buildings operate at about 0.82-0.89 PF, while industrial users operate at about 0.60-0.85 PF. Electric utilities typically charge a Power Factor Penalty of 5-15% for the electricity used when the PF is too low.

A typical methodology for calculating the PF penalty might be as follows:

- Measure Actual Power in Watts, which are billed as kilowatt-hours (KWh)
- Measure Apparent Power which is larger and calculated to reflect the problems caused by a low PF. The problems that create a larger Apparent Power include larger circuit breakers and wiring as well as more wasted power reflected back to the power company causing additional cost for the utility. Apparent power is measured in Volt-Amps and reported as KVA.
- The formula might be: Customer pays 90% of Real Power in KW or 100% of the Apparent Power in KVA, whichever is greater. Since Apparent Power can be significantly larger than Real Power when PF is low, the PF Penalty often applies; and how much this penalty is depends on how low the PF is. Electric meters measure both values pretty much everywhere except residential homes where only Watts are measured.

Power Correction Devices are available for purchase. These devices are essentially capacitors, which can minimize this problem by capturing and putting back to work the wasted electricity. These Power Correction Devices can be part of a specific piece of equipment and serve only that piece of equipment; never has such a device been installed captive to a pulsed power water treatment unit. Large Power Correction Devices can be installed for an entire building that has a lot of low PF inductive load equipment at the facility (such as motors, transformers, welding machines and induction heating coils). These are quite expensive and rarely applied except in large manufacturing facilities. Most Wave customers would not have these devices.

The Wave's PF is a respectable 0.85 averaged across the sizes offered, while the Dolphin's PF is about 0.2-0.3, depending on coil size and other factors. Below is a comparison of 10" pulsed power units:

10" Units	Volts	Amps Used	Real Power (Watts)	PF	Apparent Power (Real Power ÷ PF = Volts-Amps)
Wave	120	1.27	120 W	0.77	178 VA
Dolphin	230	8.51	362 W	0.19	1,872 VA

Today, engineers and facility managers are quite sensitive to equipment with low PFs even if the power consumption of that equipment is not huge. A specification could include either Power Factor or more likely Apparent Power Consumption measured in Volts-Amps (VA), which Dolphin would not be able to meet.

Below is a table indicating this comparison for each size Wave and Dolphin. 16" and 24" Wave data will be added soon.

Power Factor and VA Comparison

Size inches	WAVE				Dolphin		WAVE VA Difference
	Voltage, Single Phase	Real Power Watts	PF	Apparent Power VA	Voltage, Single Phase	Apparent Power VA	
1	120	59	0.94	63	120	154	-91
2	120	87	0.95	92	120	225	-133
3	120	58	0.93	62	120	405	-343
4	120	49	0.91	54	120	490	-436
5	120	42	0.91	46	N/A	N/A	N/A
6	120	50	0.8	63	120	480	-418
8	120	41	0.86	48	230	1665	-1617
10	120	120	0.77	156	230	1730	-1574
12	120	111	0.75	148	230	1600	-1452