ENERTECH ENERGY + TECHNOLOGY Eneretch Global 2506 S. Elm Street Greenville, IL 62246 www.enertechusa.com	TECHNICAL BULLETIN	Tech Bulletin #:	TB19.005-Rev. B
	WV Variable Speed Water-to-Water Unit Pump Changes	Publish Date:	23SEP2019
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Overview

Starting immediately, the WV variable speed water-to-water units with ***Serial Number M19090400*** and thereafter, will include the upgraded UPM-XL (UPMXL 25-124) variable speed load and source pumps. Any WV unit prior to this serial number will consist of Magna GEO (MAGNA 32-140) for both pumps. The WV was originally designed with a single Magna GEO pump internal to the unit as the load pump for the hydronic system and a choice of a single Magna GEO or a two-pump flow center (one variable speed, one constant speed) for the source piping (ground loop). The new UPM-XL pump upgrade provides similar performance as the Magna GEO but is more efficient (max. energy use for the Magna GEO is 230 Watts; max. energy use for the new UPM-XL is 180 Watts). This technical bulletin will provide some guidelines on pump sizing, since there is a slight difference in performance.

The pump performance will have virtually no effect on model 040, since nominal flow rate is 12 gpm; the performance at 12 gpm is very similar for the two pumps. There are some applications, where the 060 may need a second pump on the flow center for the source piping (ground loop). In most cases, a single UPM-XL internal load pump will be sufficient for the hydronic piping system. Below are examples to illustrate the differences between the two pumps for a typical 5 ton source (ground loop) piping system (see examples #2 and #3).

For load pump sizing (hydronic piping), consideration must be given to the fact that a single variable speed load pump is factory-installed. Like the source side pumping, the difference in pump performance will have virtually no effect on the model 040. In most cases, the 060 will not be affected, either. However, if the hydronic piping has very high pressure drop, a second external pump may be required. This is not common, since the load side flow rate may be lower than the source side flow rate. As the flow rate is decreased, the pressure drop decreases significantly. Figure 1 illustrates the pressure drop of the components inside the WV unit (heat exchanger, diverting valve, connections, etc.). The total system pressure drop is the pressure drop of the unit plus the pressure drop of the piping system. Examples #3 and #4 illustrate pressure drop and pump sizing for a typical 5 ton load (hydronic) piping system.

Figure 1: WV Load Side Pressure Drop

Model	Load GPM	Load Side Pressure Drop with Antifreeze							
		50 °F		80 °F		100 °F		110 °F	
		PSI	FT HD	PSI	FT HD	PSI	FT HD	PSI	FT HD
WV040	4.0	1.2	2.8	1.1	2.6	1.1	2.5	1.0	2.4
	5.0	1.9	4.3	1.7	4.0	1.7	3.8	1.6	3.7
	6.0	2.5	5.8	2.3	5.4	2.2	5.2	2.2	5.1
	8.0	4.4	10.2	4.2	9.6	4.0	9.3	4.0	9.2
	10.0	6.8	15.6	6.4	14.8	6.2	14.3	6.2	14.2
	12.0	9.5	21.8	9.1	21.0	8.9	20.5	8.9	20.4
	15.0	14.5	33.4	14.1	32.4	13.8	31.9	13.7	31.7
	18.0	20.7	47.8	20.1	46.5	19.8	45.7	19.5	45.0
WV060	5.0	1.8	4.1	1.6	3.8	1.6	3.6	1.5	3.5
	6.0	2.4	5.4	2.2	5.1	2.1	4.9	2.1	4.8
	8.0	4.1	9.5	3.9	9.0	3.8	8.7	3.7	8.6
	10.0	6.4	14.6	6.0	13.7	5.8	13.4	5.7	13.2
	12.0	8.8	20.2	8.3	19.1	8.1	18.7	8.1	18.6
	15.0	13.3	30.7	12.8	29.4	12.6	28.9	12.5	28.7
	18.0	18.9	43.7	18.4	42.4	17.9	41.3	17.8	41.1
	20.0	23.3	53.8	22.6	52.2	22.0	50.7	21.7	50.1

1. Load WPD data are based on 15% (by volume) methanol solution while the unit and the load-side pump are off.
2. Pressure drop data accurate within ±25%.
3. Unit test is run without hot water generation.
4. Interpolation of unit pressure drop data is permissible; extrapolation is not.
5. Due to variations in installation, actual unit performance may vary from the tabulated data.
6. This table is for use in design the hydronic piping system. DO NOT use this table for troubleshooting (refer to the flow rate at the HMI (display). The pump is located at the inlet of the heat exchanger (pumping towards the heat exchanger). Therefore checking pressure drop at the P/T plugs will provide pressure drop of the piping system, not the pressure drop across the heat exchanger.

Example #1 (source piping): 5 ton horizontal slinky loop with 25% propylene glycol and 1000 ft. circuits.
Pressure drop for a 5 circuit slinky loop with 3/4" piping, 1000 ft. circuits and 100 ft. (one-way) 1-1/4" supply/return lines is about 62.6 ft. of head at 15 gpm.

Pump sizing with the Magna GEO pump provides 11.7 gpm (Figure 2). Technically, the flow rate meets the minimum requirements (see section 16 of the WV I.O.M.). However, it is right at the minimum requirement; a two-pump flow center would be a better option.

Pump sizing with the UPM-XL (new pump) provides 11.3 gpm (Figure 3). One pump will not provide minimum flow rate; a two-pump flow center will be required (Figure 4). With two pumps, the flow rate is between the minimum and nominal flow rate at 13.6 gpm.

Even though there is only 0.4 gpm difference between the two pumps, horizontal loops with relatively high pressure drop will require a two-pump flow center. However, it would have probably been good practice to have two pumps with the Magna GEO, since it was right on the minimum requirement, and any deviation from installation could have caused a low flow issue.

Figure 2: Single Magna GEO Pump Sizing -- Horizontal Slinkly Loop

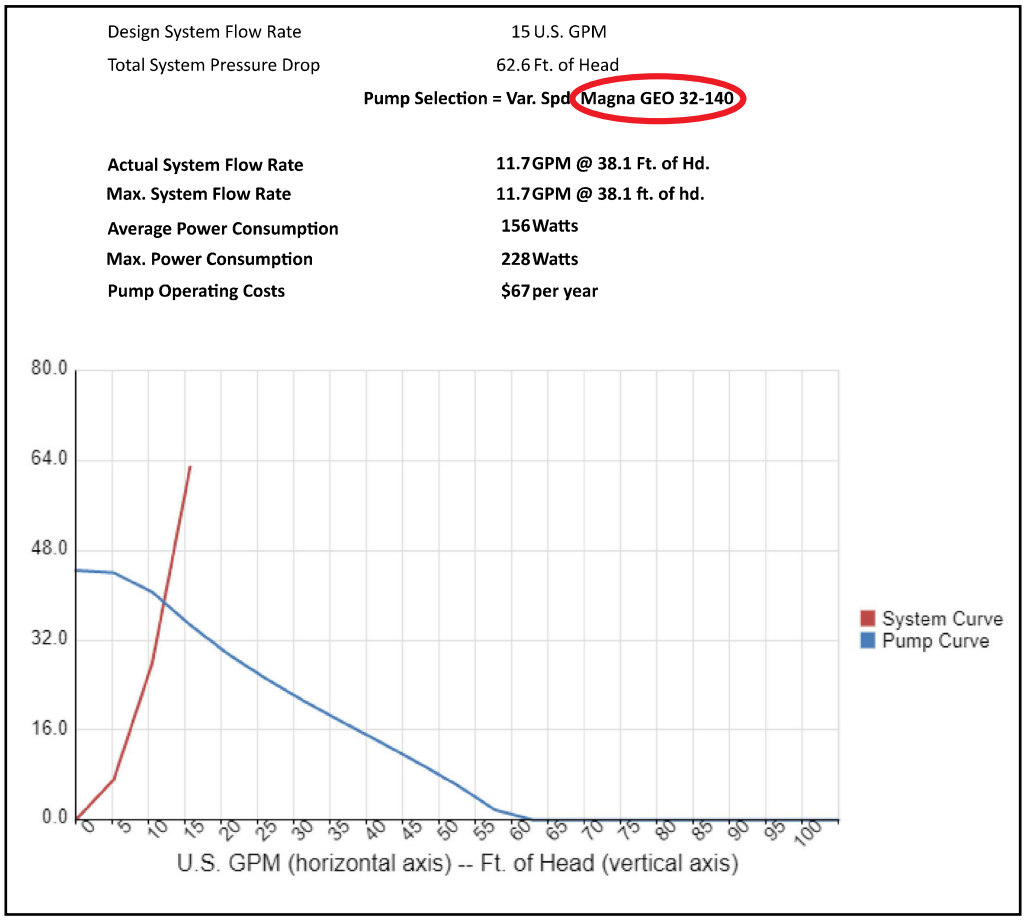


Figure 3: Single UPM-XL Pump Sizing -- Horizontal Slinkly Loop

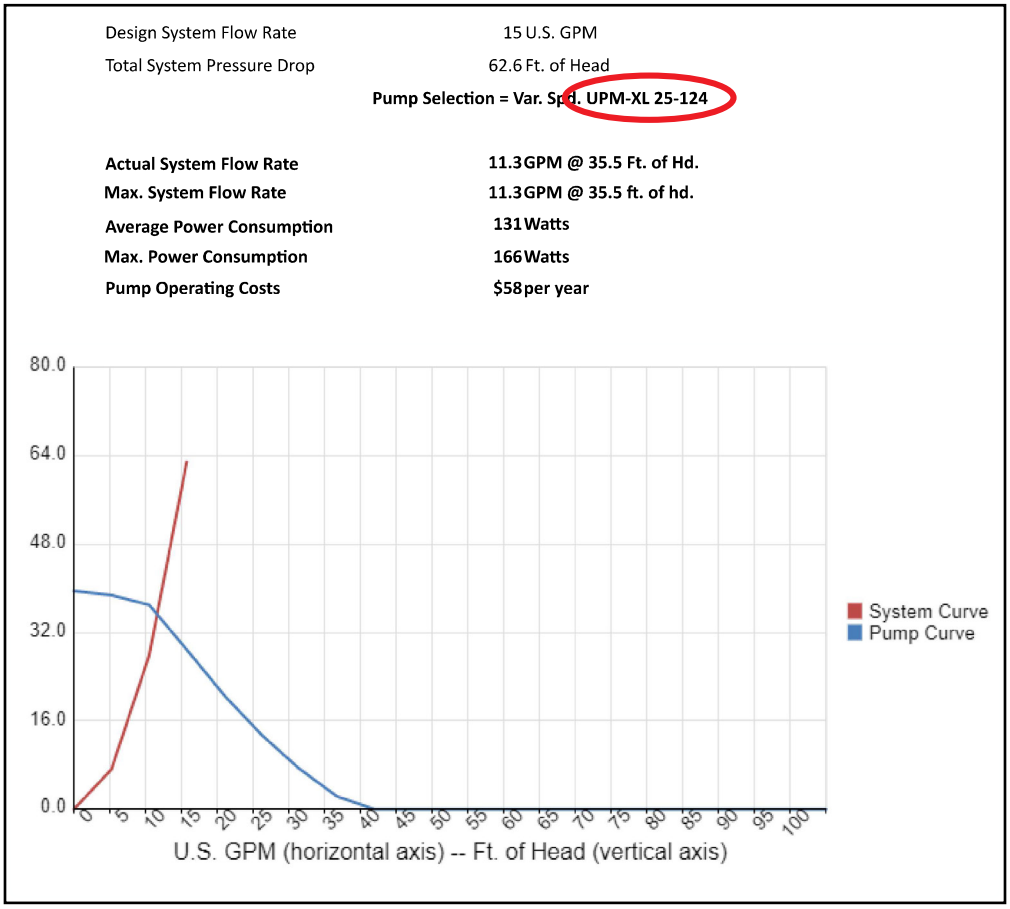
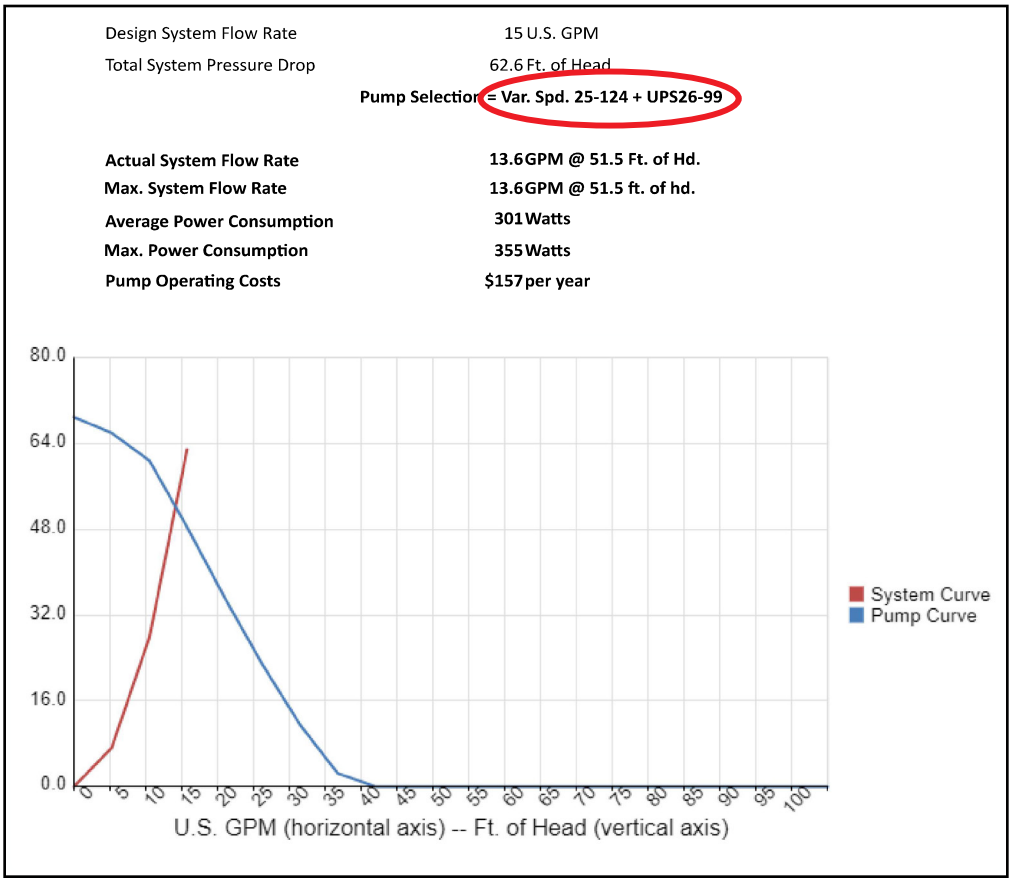


Figure 4: Two-pump UPM-XL Pump Sizing (UPM-XL in series with UPS26-99) -- Horizontal Slinkly Loop



Example #2 (source piping): 5 ton vertical loop with 20% methanol and 300 ft. circuits (150 ft. bores)
Pressure drop for a 5 circuit vertical loop with 3/4" piping, 300 ft. circuits and 100 ft. (one-way) 1-1/4" supply/return lines is about 35.4 ft. of head at 15 gpm.

Pump sizing with the Magna GEO pump provides 14.8 gpm (Figure 5). A single variable speed Magna GEO pump provides almost nominal (15 gpm) flow rate.

Pump sizing with the UPM-XL (new pump) provides 13.9 gpm (Figure 6). One pump will provide within about 1 gpm of nominal flow and will provide higher than minimum flow rate.

Vertical loops with relatively low pressure drop will typically be fine with a one-pump flow center. In this case, the upgrade from the Magna GEO to the UPM-XL pump will not have a significant impact on pump sizing, and will operate at lower Watts. A two-pump flow center will provide nominal flow, but will use more energy than a single pump flow center (Figure 7), since the constant speed pump (180 Watts) will be energized any time the compressor runs, and the variable speed pump will be adjusted to "dial" in the flow rate needed based upon compressor speed. In most cases, it does not make economic sense to add a second pump when the pressure drop is in the range of this example.

Figure 5: Single Magna GEO Pump Sizing -- Vertical Loop

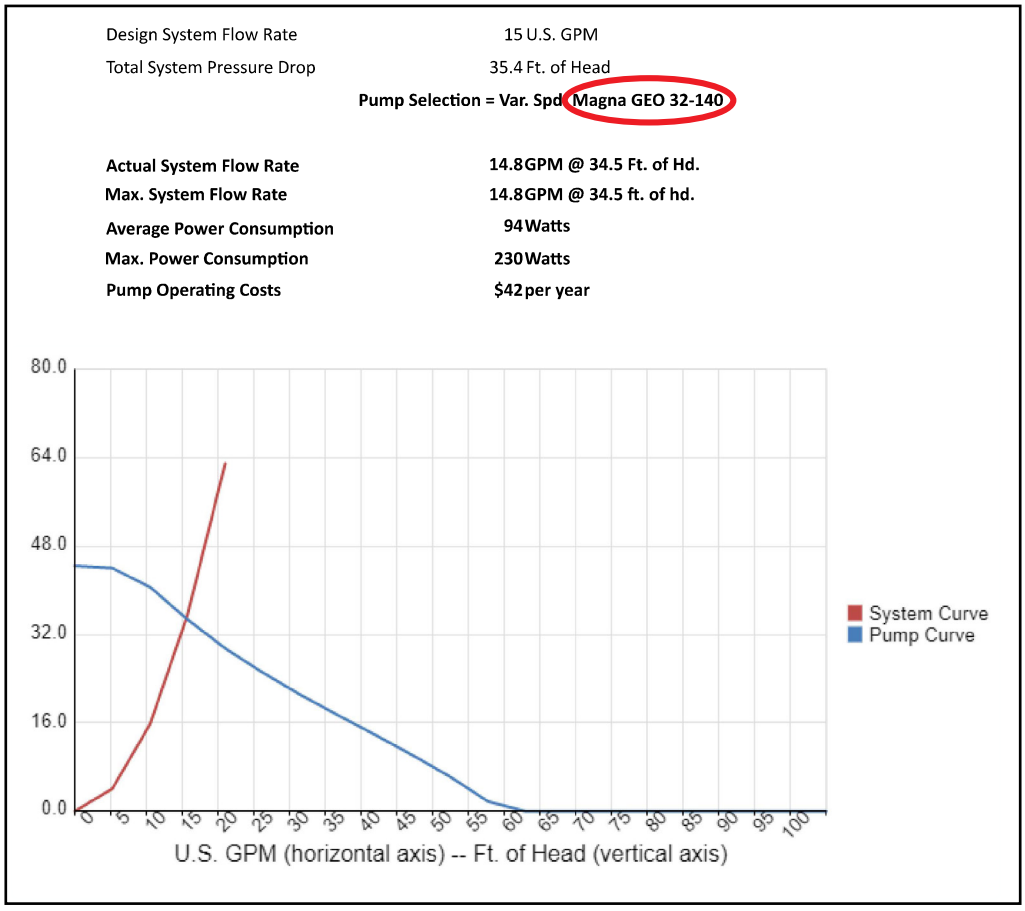


Figure 6: Single UPM-XL Pump Sizing -- Vertical Loop

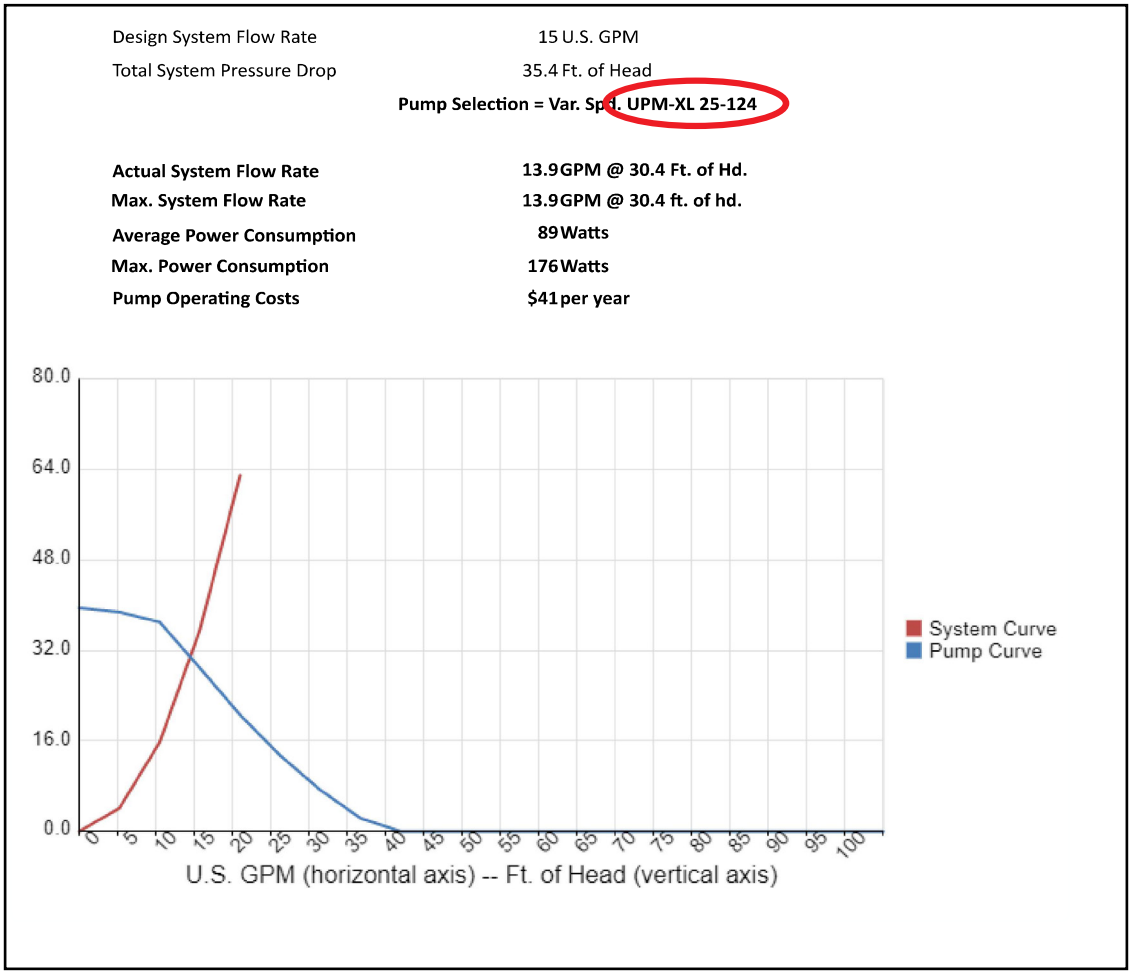
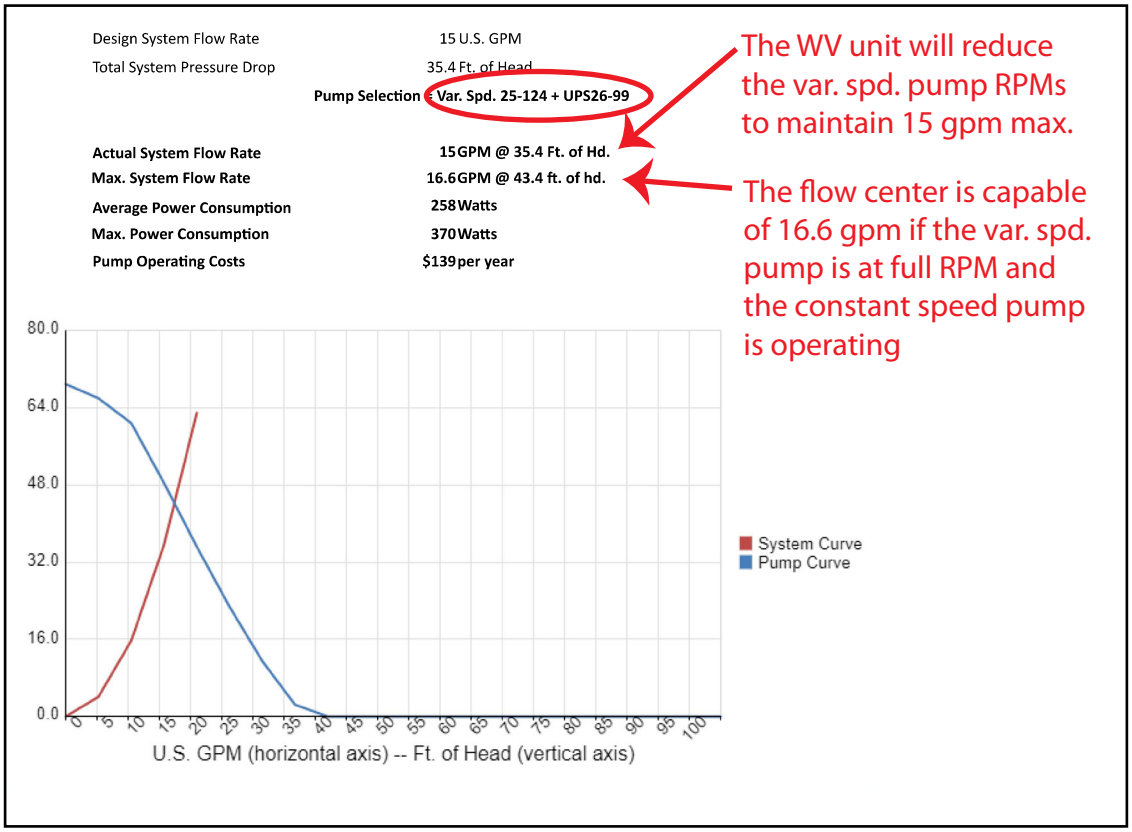


Figure 7: Two-pump UPM-XL Pump Sizing (UPM-XL in series with UPS26-99) -- Vertical Loop



Example #3 (load piping): Typical six zone radiant floor system with 1/2" PEX circuits (heating only).
Pressure drop for a 6 zone radiant floor system with 1/2" PEX circuits is about 41.7 ft. of head at 15 gpm (includes 29.4 ft. of head for the unit from Figure 1).

Pump sizing with the Magna GEO pump provides 13.9 gpm (Figure 8). A single variable speed Magna GEO pump provides within about 1 gpm of nominal (15 gpm) flow rate.

Pump sizing with the UPM-XL (new pump) provides 13.1 gpm (Figure 9). One pump will provide between nominal flow and minimum flow rate with some room to spare.

In most cases, a single variable speed pump (Magna GEO or the new UPM-XL) will provide plenty of flow for radiant floor systems. ***The Taco differential bypass valve that is shipped with the unit should be set to maintain a minimum of 5 gpm when the smallest zone is operating to ensure enough flow rate if only the smallest zone is calling for heat.***

Figure 8: Single Magna GEO Pump Sizing -- Load Piping, Radiant Floor

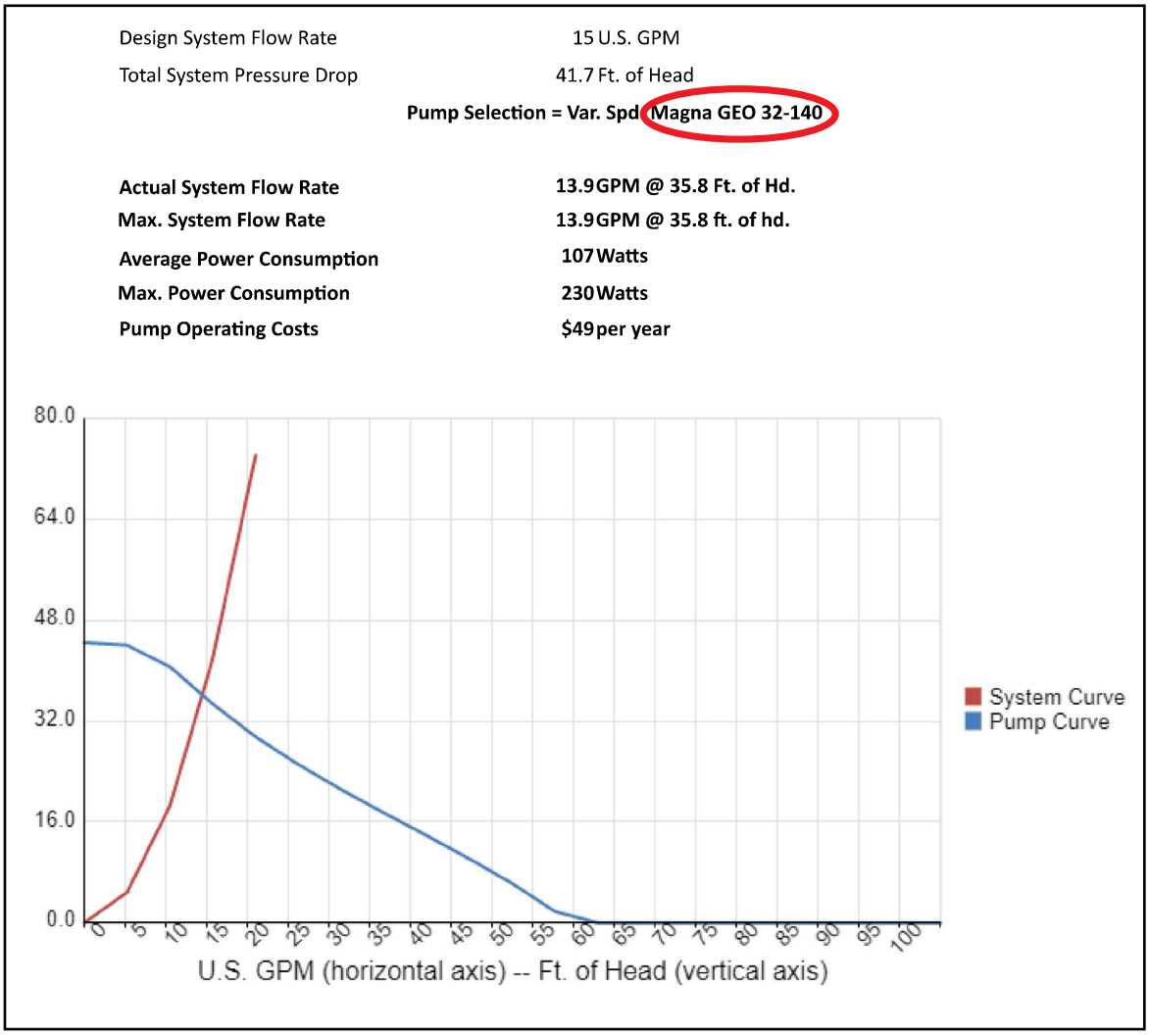
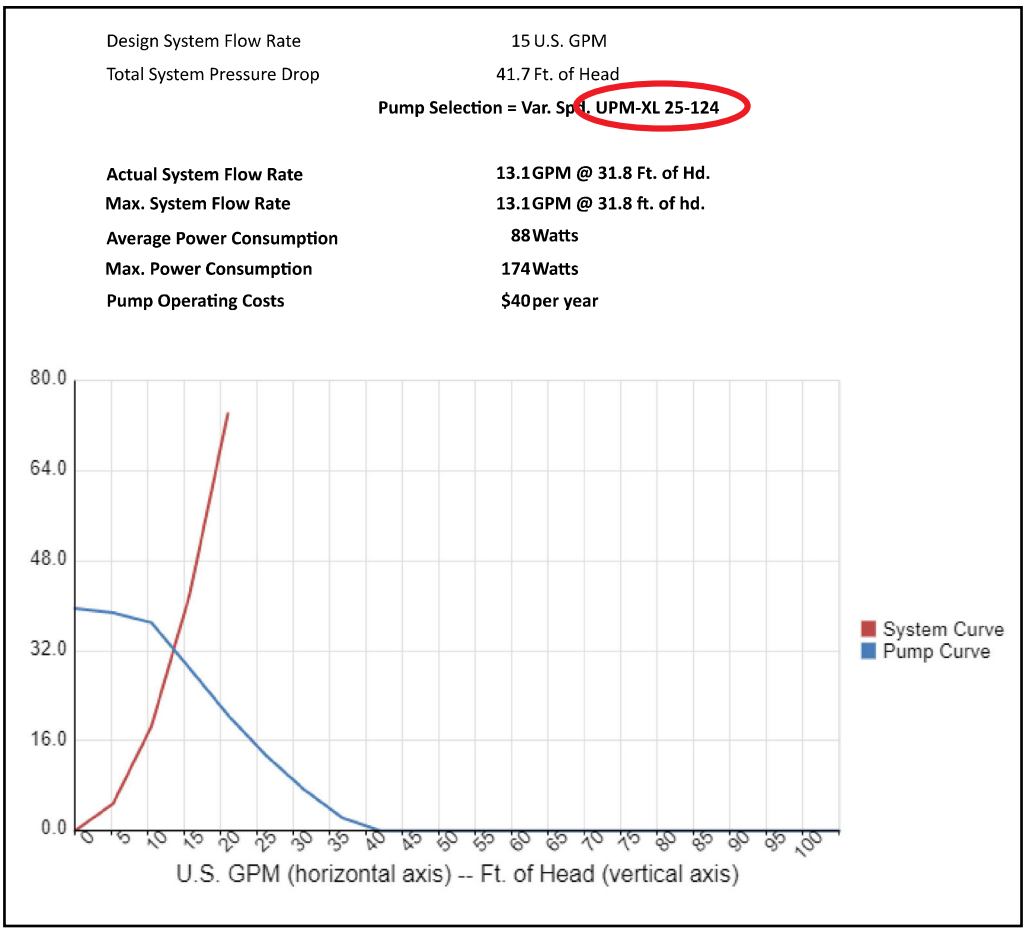


Figure 9: Single UPM-XL Pump Sizing -- Load Piping, Radiant Floor



Example #4 (load piping): Typical six zone radiant floor system with 1/2" PEX circuits for heating and 4 ton fan coil for cooling with 25% propylene glycol antifreeze.
Pressure drop for a 6 zone radiant floor system with 1/2" PEX circuits and a single 4 ton fan coil is about 44.6 ft. of head at 15 gpm (includes 29.4 ft. of head for the unit from Figure 1).

Pump sizing with the Magna GEO pump provides 13.5 gpm (Figure 10). A single variable speed Magna GEO pump provides between minimum and nominal flow rate.

Pump sizing with the UPM-XL (new pump) provides 12.8 gpm (Figure 11). One pump will provide between nominal flow and minimum flow rate. Even though it is about 0.7 gpm less than the Magna GEO, the minimum load (hydronic piping) flow rate for the WV unit is less than the source (ground loop) minimum. Flow rates above 10 gpm on the load side piping are acceptable. At the lower flow rates, the pressure drop is significantly lower.

In most cases, a single variable speed pump (Magna GEO or the new UPM-XL) will provide plenty of flow for hydronic systems. ***The Taco differential bypass valve that is shipped with the unit should be set to maintain a minimum of 5 gpm when the smallest zone is operating to ensure enough flow rate if only the smallest zone is calling for heating or cooling.***

Figure 10: Single Magna GEO Pump Sizing -- Load Piping, Radiant Floor with Fan Coil for Cooling

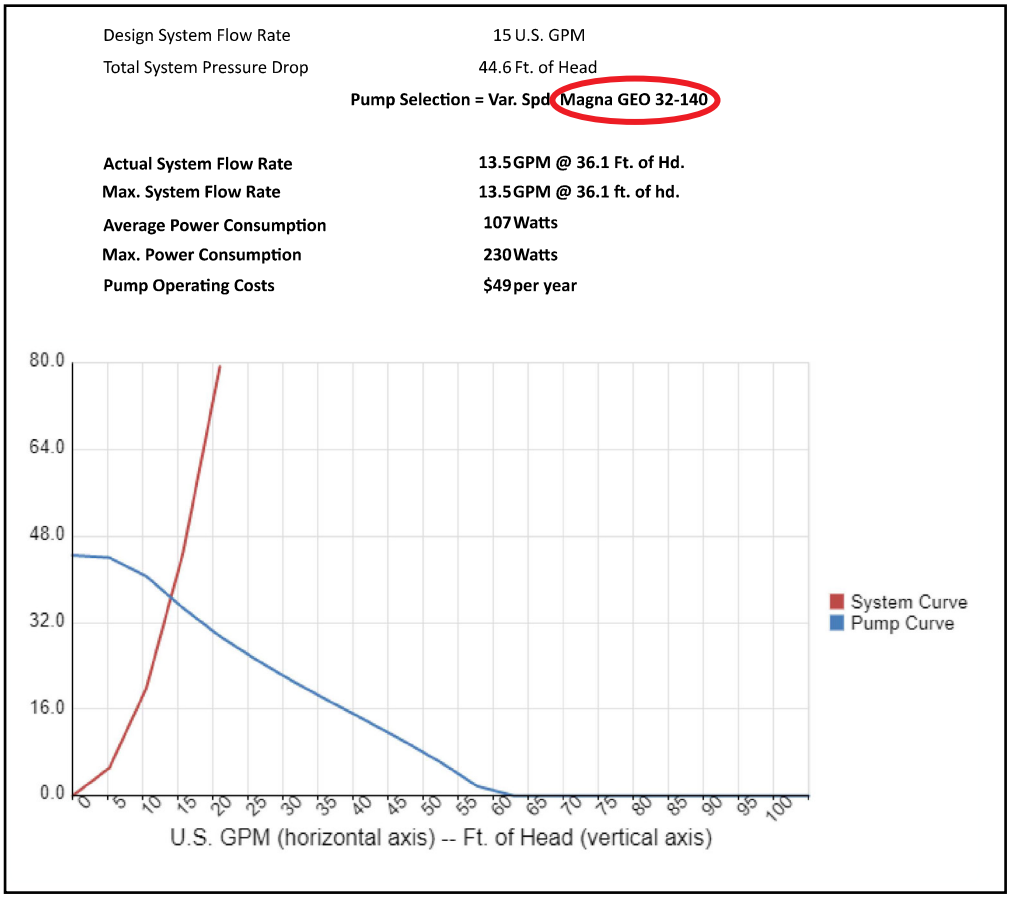
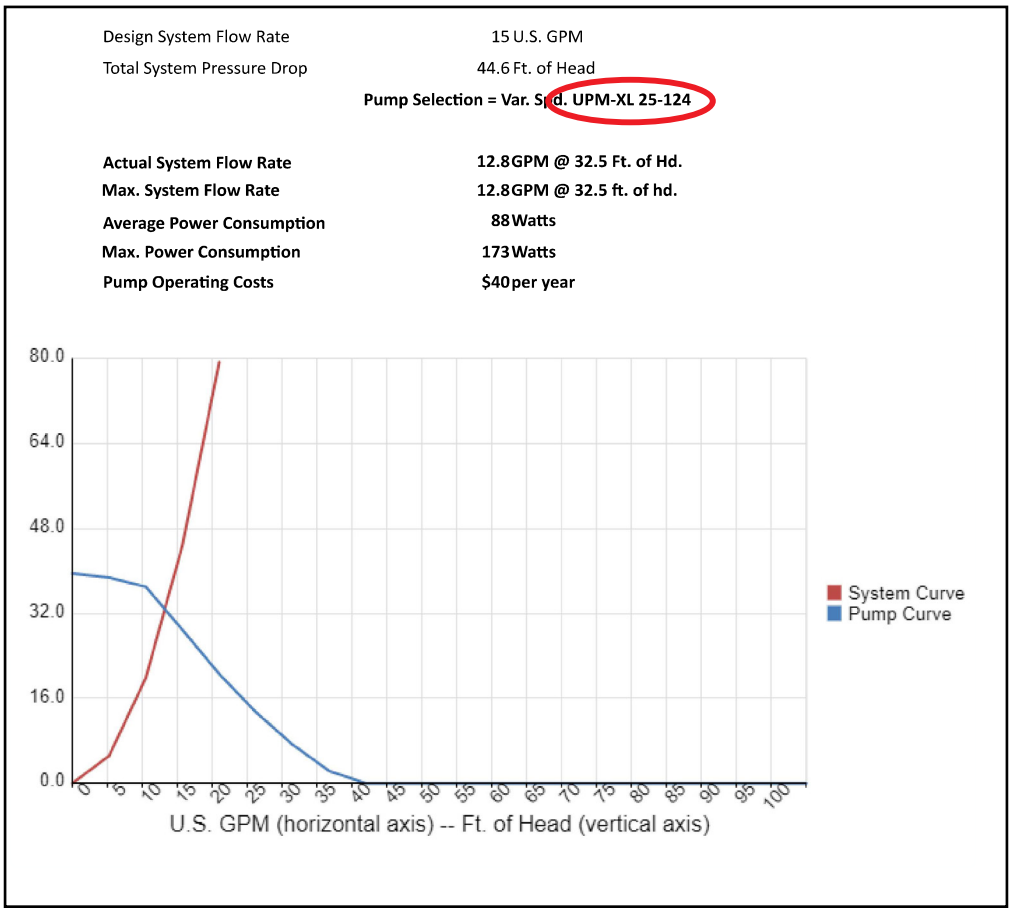


Figure 11: Single UPM-XL Pump Sizing -- Load Piping, Radiant Floor with Fan Coil for Cooling



Summary

Although it is helpful to be aware of the differences between the Magna GEO variable speed pump and the new UPM-XL variable speed pump, in most cases (up to about 14 to 15 gpm), the UPM-XL will perform very similar to the older Magna GEO. In cases where the pressure drop is higher, a second pump may be needed. However, it is important to review the pressure drop of the system (ground loop or hydronic piping) to determine the proper pump selection that will provide between minimum and nominal flow rate for the WV unit. The additional pump adds about 180 Watts of unnecessary energy use if a single pump can provide enough flow.

Figure 12 illustrates how the two pump curves compare, as well as comparisons to UPS26-99 pumps (single pump or two in series). Even though the Magna GEO curve (blue line) appears to be noticeably higher in feet of head than the UPM-XL curve (green line), notice where the example system curve (black line) crosses the two pump curves (points A and B). The maximum operating point is where the system curve crosses the pump curve. Point A is the flow rate using the Magna GEO with the example system pressure drop (11.7 gpm); point B is the flow rate using the UPM-XL with the example system pressure drop (11.2 gpm). In most cases, there is only 0.5 to 1 gpm difference in operation between the two pumps, depending upon the actual system curve.

Figure 12: Pump Curve Comparisons