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**AURORA PUMP**

BULLETIN 700/REV. E

700 SERIES

**APCO-MATIC DDC  
VARIABLE  
SPEED  
PUMPING  
SYSTEMS**

**Applications:**

- HVAC Applications
- Water Supply Pumping
- Sewage Pumping

**Benefits:**

- Total System Responsibility
- 3-Year Warranty
- Save Money



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## **APCO-MATIC VARIABLE SPEED PUMPING SYSTEM**

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You save money with Aurora Pump's Apco-matic Variable Speed Pumping System.

The competitive price is matched with the lowest installation cost of any system available. The Apco-matic is easy to install and start-up. And you get complete technical support from Aurora Pump experts.

Now you can get this dependable, reliable and easy-to-use system that has been field-proven in thousands of installations for over 25 years. Backed with a 3-year warranty.

You can save money in heating and air conditioning applications, as well as a wide range of water supply and sewage pumping applications.

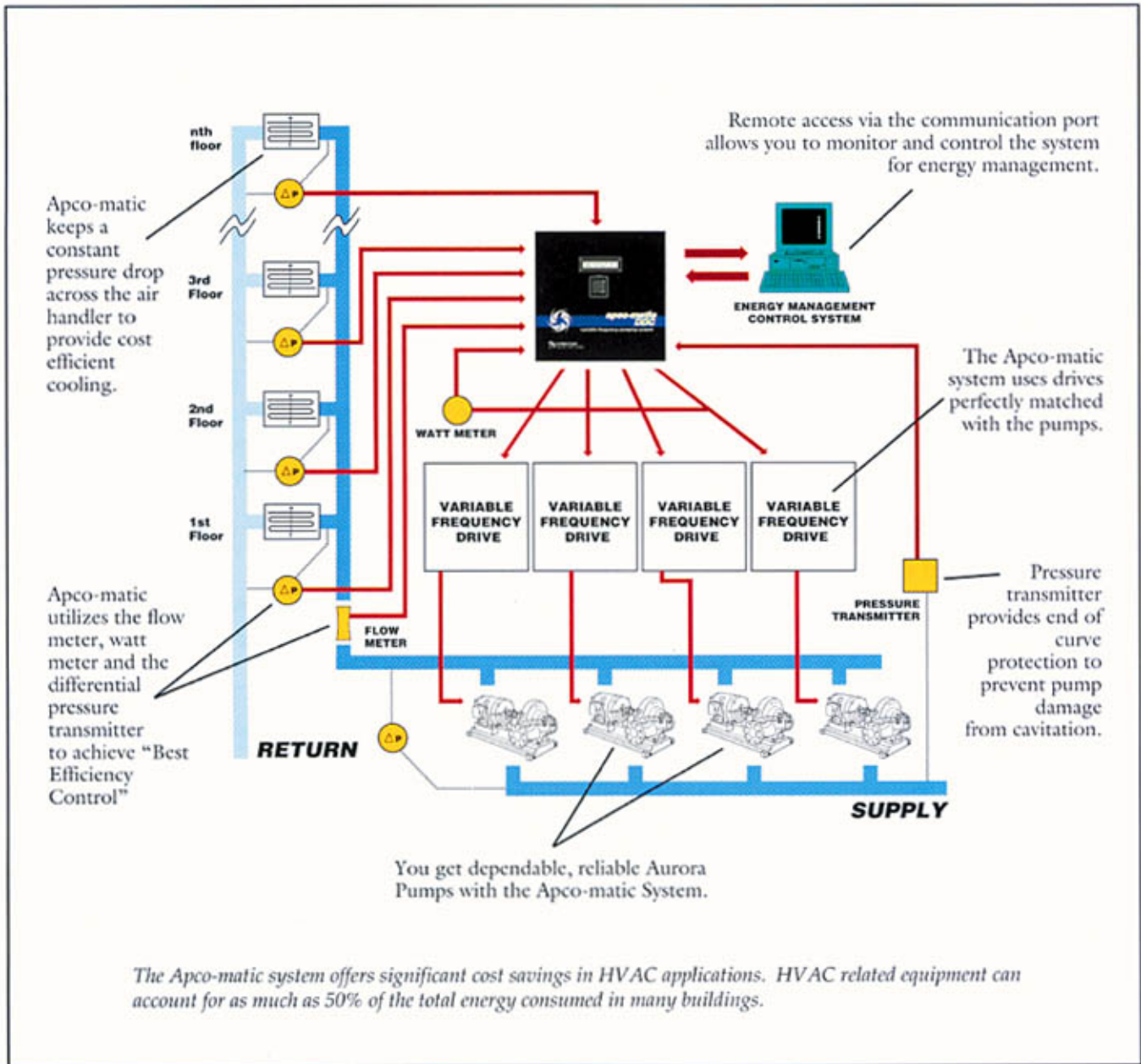
### **Applications:**

- Commercial Buildings
- Hospitals
- Airports
- Universities
- Industrial Complexes
- Municipal Water Installations
- Sewage Lift Stations
- Sewage Treatment Plants
- Industrial Waste Services

### **Benefits:**

- Total System Responsibility
- 3-Year Warranty
- Competitive Price
- Save Money
- Low Cost Installation
- Easy to Install
- Easy to Use
- Easy to Upgrade
- "Best Efficiency Control"
- Save on Retrofit
- Save Money on Space
- Increase Reliability
- Increase System Security
- Technical Support

## Apco-matic Typical HVAC Variable Speed Pumping System



### Total System Responsibility

With the Apco-matic you have one point-of-contact with total system responsibility. Aurora Pump stands behind the complete system: pumps, motors, drives, control program and sensors.

Aurora Pump guarantees that all components will interface properly and work as a system. Aurora Pump provides complete warranty, service, and on-going technical support.

Aurora Pump provides technical installation support and application and engineering assistance for the life of the system.

# APCO-MATIC VARIABLE SPEED PUMPING SYSTEM

## Easy, Inexpensive Installation

The Apco-matic DDC is inexpensive to install and easy to start-up. You save on installation because its light-weight and small size (< 4 cubic feet) allow handling by 1 person. Other systems require 4 people. And with the Apco-matic DDC you don't need special equipment like lifts or rigs.

The Apco-matic is easy to start up with menu-driven programmable control. The menus prompt you to enter all relevant information to set the program up. It asks for the number of pumps and transmitters, and type of add/shed control. The Apco-matic effortlessly leads you through setting up GPM, RPM, and the other parameters. It asks you for control and alarm set points.

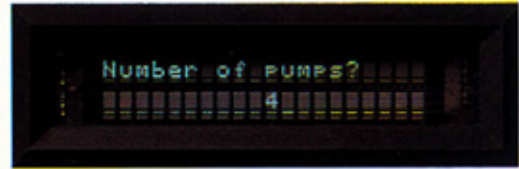
## Easy to Use and Upgrade

The Apco-matic is easy to monitor and adjust with menu-driven programmable control.

The status display allows instant overview of operating characteristics. The default status display shows you the set point, the process variable, and drive count in addition to speed, flow, or efficiency depending upon the set up.

You can choose to alternate the default display with 4 option displays to easily see the lead pump, running pumps, and pumps under maintenance. Large LED bargraphs can show set point and process variable parameters as well as speed or level for easy viewing across the room.

You can monitor system status and control the system from a remote computer terminal or energy management control system through the DDC's communication port.

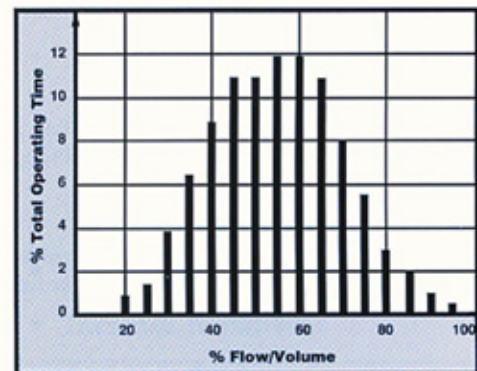


*The Apco-matic is easy to start up, adjust, and upgrade with menu-driven prompts. Here, the operator has indicated there are 4 pumps in the system.*

When you upgrade a system, you or your customer can easily re-enter the set up program and use the menu prompts to add pumps, drives, and transducers to the system. You need no additional software or input/output hardware.

## Save Money

Pumping uses expensive electricity. The Apco-matic cuts your electricity usage by automatically pumping only what is required by the system.



*Figure 1. The typical system operates at around 50% of design flow 15 times more often than at 100%. The Apco-matic saves money by pumping only the required flow when needed.*

Pumping requirements can change minute-by-minute from 100% full load to near 0% depending on the time of day, building occupancy, and the weather. Figure 1 shows that the typical duty cycle of a system operates around 50% of the full load design.

The Apco-matic monitors system demand and drives the motor and pump to provide only the required flow and pressure.

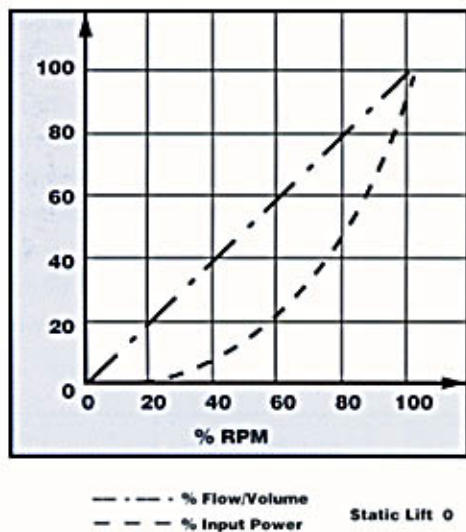


Figure 2. Apco-matic cost savings are more dramatic because electricity use falls faster than the flow with variable speed pumping.

Your cost savings are more dramatic because electrical power consumption falls faster than the flow. As shown in Figure 2, reducing the speed by 50% lowers output flow by 50%, but reduces brake horsepower and electricity use by 87.5%.

## Save Money with "Best Efficiency Control"

The Apco-matic saves you even more money with multiple pump systems. In addition to achieving economies by traditional staging (adding pumps into the system as demand increases and shedding pumps as demand decreases), the Apco-matic DDC gives you "Best Efficiency Control."

The Apco-matic analyzes flow, delta pressure, RPM, and kilowatt consumption. It then automatically chooses the optimum number of pumps and sets the RPM to minimize kilowatt use.

You achieve the highest overall efficiency at lowest cost and satisfy the system requirements.

## Save on Retrofit

The space-saving design makes the Apco-matic DDC ideal for retrofit installation. Space is usually very limited when replacing older units. The Apco-matic is the smallest unit available.

Significant savings can be achieved by replacing constant speed systems with the Apco-matic Variable Speed Pumping System. Figure 3 shows that the Apco-matic uses much less energy than even 2-way valve constant speed pumps.

In retrofitting existing systems, either the present or new high-efficiency motors may be used. Motors and pumps of any manufacturer, any speed, or any enclosure may be used. The upgrade is easily accomplished by adding the Apco-matic Variable Frequency Drive (VFD) and the Apco-matic DDC.

# APCO-MATIC VARIABLE SPEED PUMPING SYSTEM

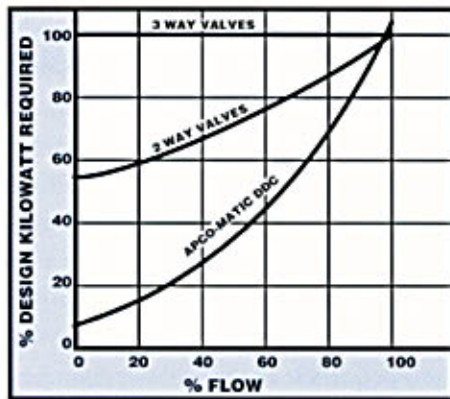


Figure 3. You save money over constant speed pumping systems in retrofit and new installations with the Apco-matic.

## Save Money on Space

You save expensive square footage with the Apco-matic DDC. Its compact size is less than 4 cubic feet

## Increase Reliability - Less Downtime

The Apco-matic enhanced Proportional Integral Derivative (PID) software provides extremely smooth, stable operation with changing pumping system requirements which in turn increases reliability and reduces downtime.

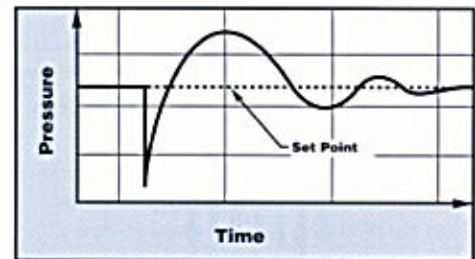
Apco-matic's enhanced PID software eliminates water hammer which means longer life for all system components. The enhanced PID prevents the VFD from "hunting" for the proper motor speed and increases motor and pump bearing life.

The Apco-matic employs an individual drive for each motor to increase overall system reliability. If one goes down, others stand ready to go to work. This designed redundancy keeps your system running and avoids costly system downtime.

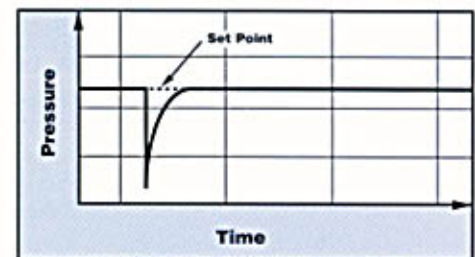
The Apco-matic lets you increase reliability by alternating pump usage by time of day, operating hours, or by add cycle. This means the workload is evenly spread across all pumping units. It also means that no one pump will sit idle to freeze up or to let bearings develop flat spots.

Internal and external component diagnostic systems in the Apco-matic keep you or your customer constantly informed of system operational status. An exhaustive system self-test upon start-up is followed by continuous self-monitoring to assure you that your commands are being executed correctly.

External equipment diagnostics continuously check the transducers, drivers, pumps and check valves. Any problem sets off alarms and triggers corrective action. For example, if a drive fails, the DDC turns the affected device off, sets off the alarm, and directs an alternate drive, motor and pump to take over.



Standard PID response searches for your set point.



The Apco-matic enhanced PID smoothly returns to your set point and increases motor and pump bearing life.



*You increase reliability by easily alternating pump use by time of day, operating hours, or by the add cycle. This menu shows that operating hours are being used to alternate pump usage.*

## Variable Speed vs. Constant Speed Pumping

While variable speed pumping is the best answer for many applications, Aurora Pump recognizes that there are some situations where constant speed is the optimum solution. Please call us for a free, no nonsense, cost-benefit analysis of variable vs. constant speed for your application.

## Increase System Security

While it is easy to set up, adjust and upgrade the Apco-matic system, two password levels ensure system security — even with remote access. You are assured of maintaining the proper operating parameters and preventing unauthorized changes.

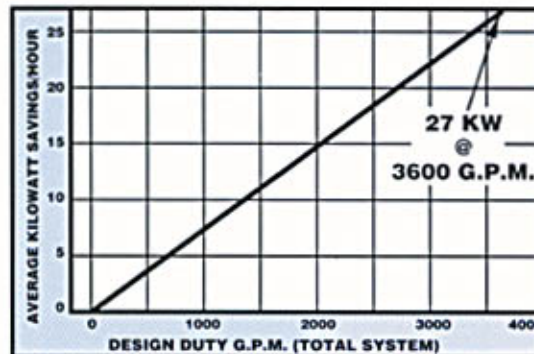
## SAVINGS WITH THE APCO-MATIC

To estimate annual savings in your system, first determine the average KW savings per hour from the above graph. Find your required flow in Gallons Per Minute (GPM) along the horizontal axis and read your average KW/HR savings along the vertical axis. Second, use your KW/HR savings in the following formula:

$$\text{KW/HR} \times \text{HRS/year} \times \text{\$/KWH} = \text{Annual Savings}$$

### EXAMPLE:

- 1) For 2000 GPM, savings are 15 KW/Hour.
- 2) 15 KW x 4000 HRS/YR x .10/KWH = \$6,000



### GRAPH BASED ON THE FOLLOWING PARAMETERS:

- |                                 |  |
|---------------------------------|--|
| a. 100 Foot design head         | e. 5 HP thru 150 HP system   |
| b. Split case Model 411 pumps   | f. Savings assume high efficiency motors on both constant speed and variable frequency drives. |
| c. Average flow 1/2 design flow | g. 2-Way valves on all chilled water terminals.  |
| d. Average head 59.5 feet       |  |

# APCO-MATIC VARIABLE SPEED PUMPING SYSTEM

## Technical Description

The Apco-matic DDC is a microprocessor based controller that is designed specifically for pumping applications. The bright fluorescent alpha-numeric display is readable over a wide angle under a broad range of lighting conditions, and the sealed keypad provides a convenient operator interface. Bidirectional communication with an energy management control system (EMCS) is supported via an RS-232/422/485 port. A sixteen channel analog to digital (A/D) converter accepts 4-20 mA and voltage signals from pressure, differential pressure, flow and kilowatt transmitters.

Isolated digital inputs are available for sensors and motor controller interface. Isolated analog and digital outputs are provided for constant and variable speed motor control.

Standard features include pump add/subtract control in response to RPM, flow, level, NPSHA, or system "Best Efficiency Control." The software and the input/output hardware to support all of the options are resident in

every unit. System upgrade can be readily accomplished at any time by installing the sensor or sensors required and selecting the desired operational features from the Set-up Menu.

The standard software supports up to four variable speed pumps and one jockey or auxiliary constant speed pump. The enhanced PID speed control algorithm provides 10 rate/gain breakpoints for smooth control over a wide range of dynamic conditions, and rate, gain, and breakpoints may be modified by keypad entry. System security is ensured by two levels of password as standard and an optional key lock.

The hardware consists of high quality printed circuit cards interconnected with ribbon cables, with pull-apart screw terminal strips for external connections. The standard enclosure is a compact NEMA 12 unit for wall mounting. The Apco-matic system is available mounted and wired with variable speed drives in a single enclosure, and with complete packaged and tested skid mounted pump systems.

EQUIPMENT TYPE	Microprocessor based process controller
APPLICATION	Variable speed pump control
CONTROLS	4 variable and 2 constant speed drives
INPUTS	12 pressure or differential pressure zones 4 flow inputs 1 KW input 1 system differential pressure 1 absolute suction pressure (used by end of curve protection program)
UNITS	English – GPM, FT. H <sub>2</sub> O, IN. H <sub>2</sub> O, PSI Metric – L/SEC, M <sup>3</sup> /HR, KPA, M H <sub>2</sub> O
DISPLAY	Alpha-numeric, 40 character, fluorescent
PROGRAMS	Pressure, Flow, Level, Best Efficiency. Programs resident in memory and keyboard selectable.
SECURITY	Password – Level 1, Level 2, Standard Keylock – Optional
COMMUNICATION	RS232/422/485
OPERATOR INTERFACE	Keypad – 16 key sealed membrane
POWER	115 VAC 500/60 HZ +/- 15%
LIMITS	40° C at 10,000 feet, 95% Non-Condensing humidity
STANDARDS	UL FILE NO. E130054 Vol. 1 Sect. 1
ENCLOSURE	NEMA 12 standard

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