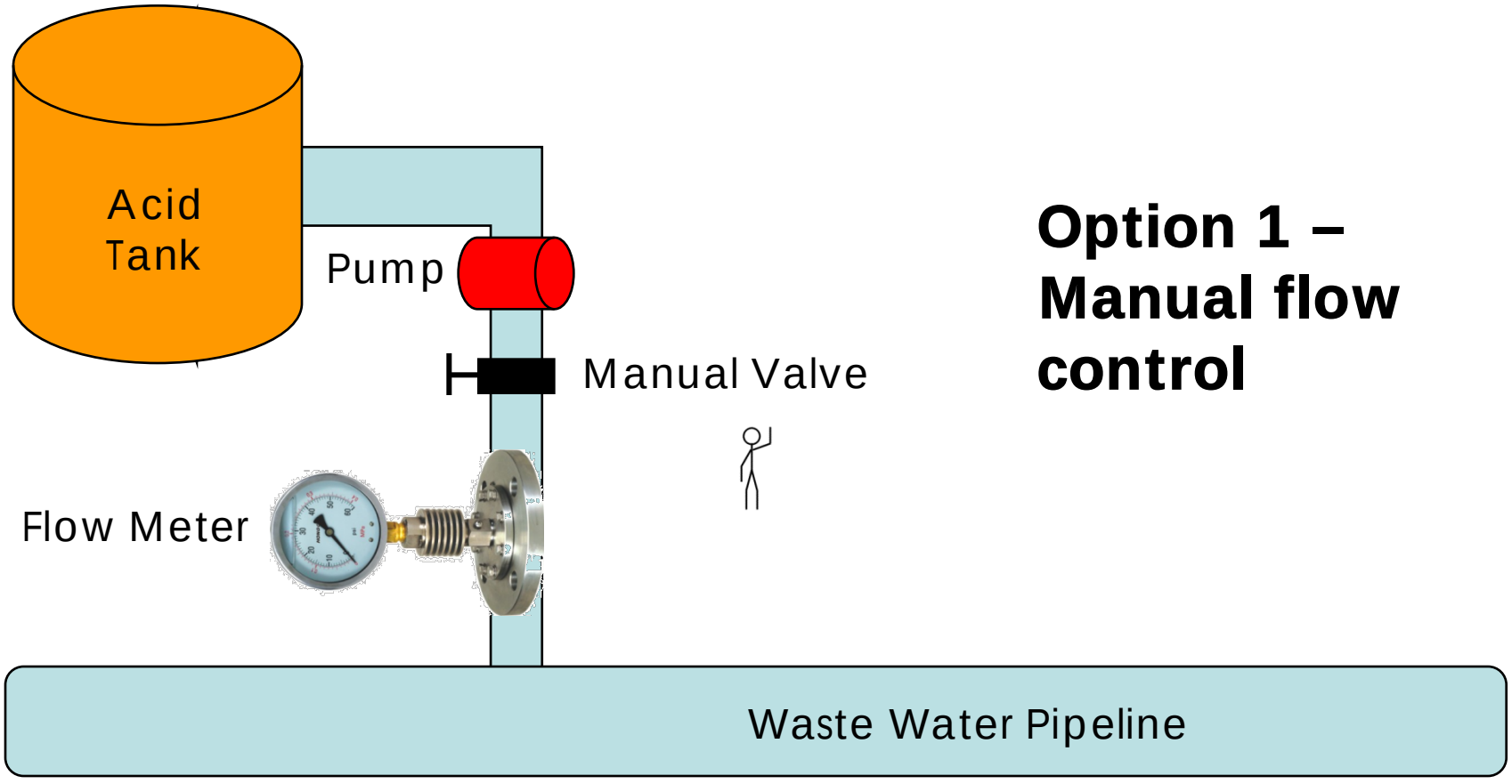
SANTERNO
GRUPPO CARRARO

Elettronica Santerno
Drives
Multipump Application

Multipump Application

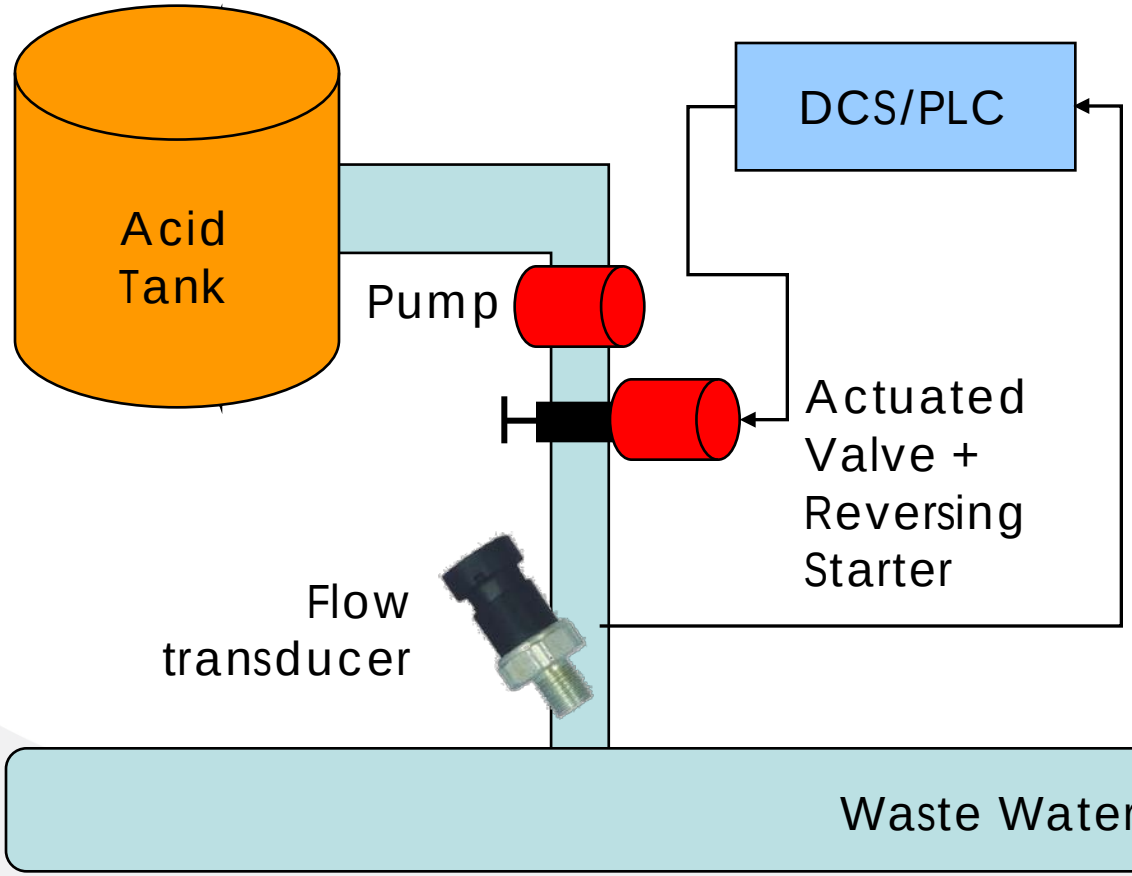
Typical application: 1/12/2009A customer wants to control the flow rate of the acid from the storage tank into the wastewater outlet using a pump.



Option 1 – Manual flow control

Multipump Application

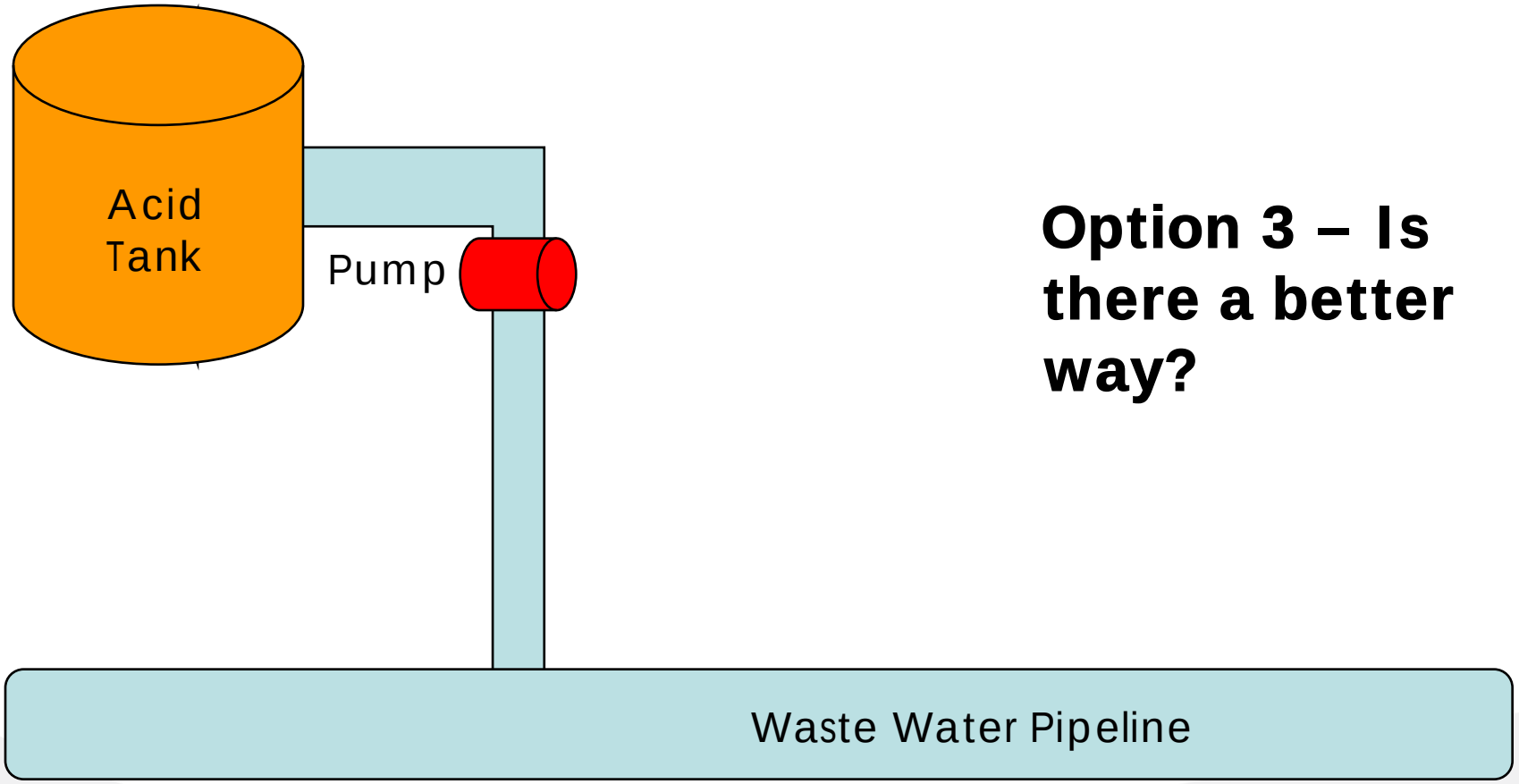
Typical application: A customer wants to control the flow rate of the acid from the storage tank into the wastewater outlet using a pump.



Option 2 – Auto flow control using DOL reversing starter

Multipump Application

Typical application: A customer wants to control the flow rate of the acid from the storage tank into the wastewater outlet using a pump.



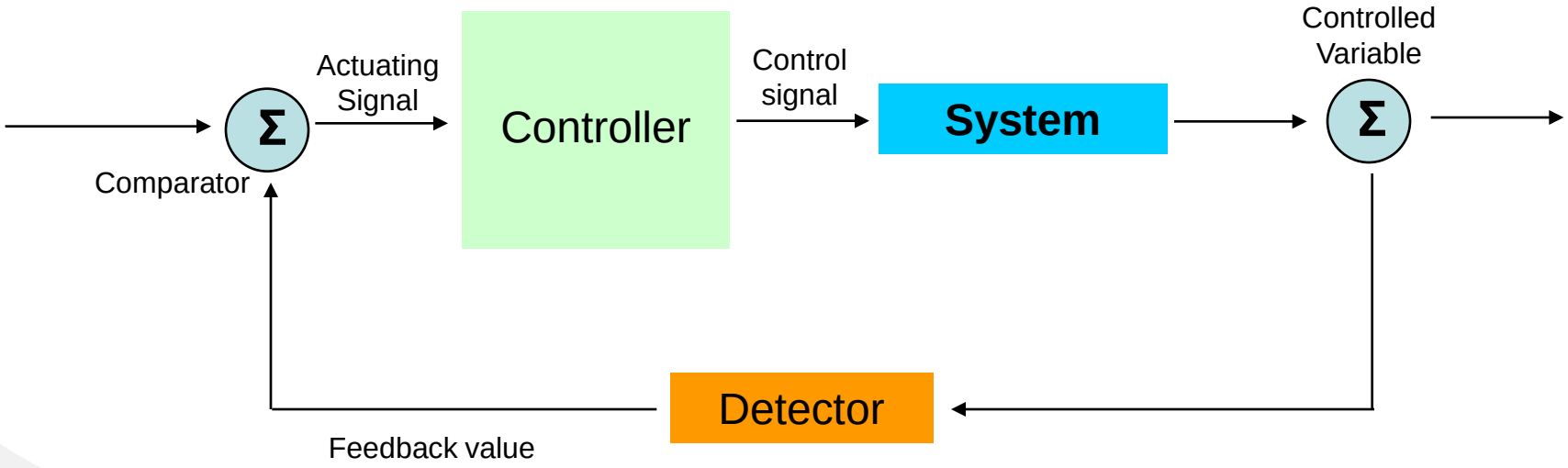
Option 3 – Is there a better way?

Multipump Application

- Yes!
- PID – Proportional Integral Derivative
- The sum of these three actions is used to adjust the process via a control element such as the position of a control valve or the power supply of a heating element.
- PID controllers attempts to correct the error between a measured process variable and a desired set-point by calculation and then outputting a corrective action that can adjust the process accordingly.

Multipump Application

PID consists of various signals and inputs.



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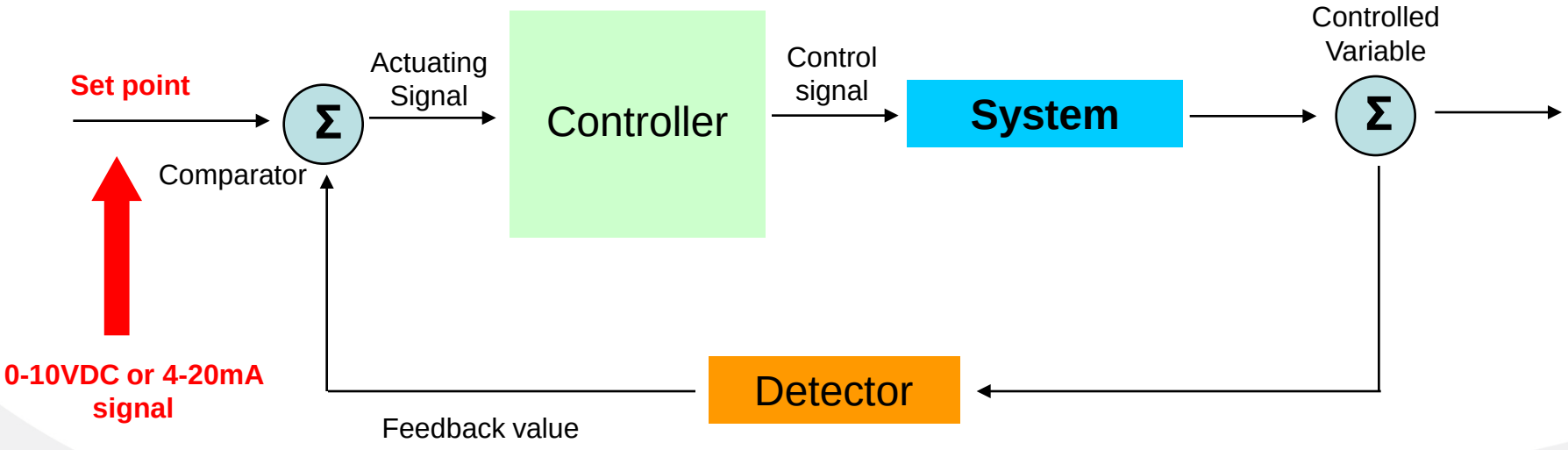
Initially a Target Value or Set-point is required to be set by the user - this could be the desired pressure, flow, temperature, vacuum, etc

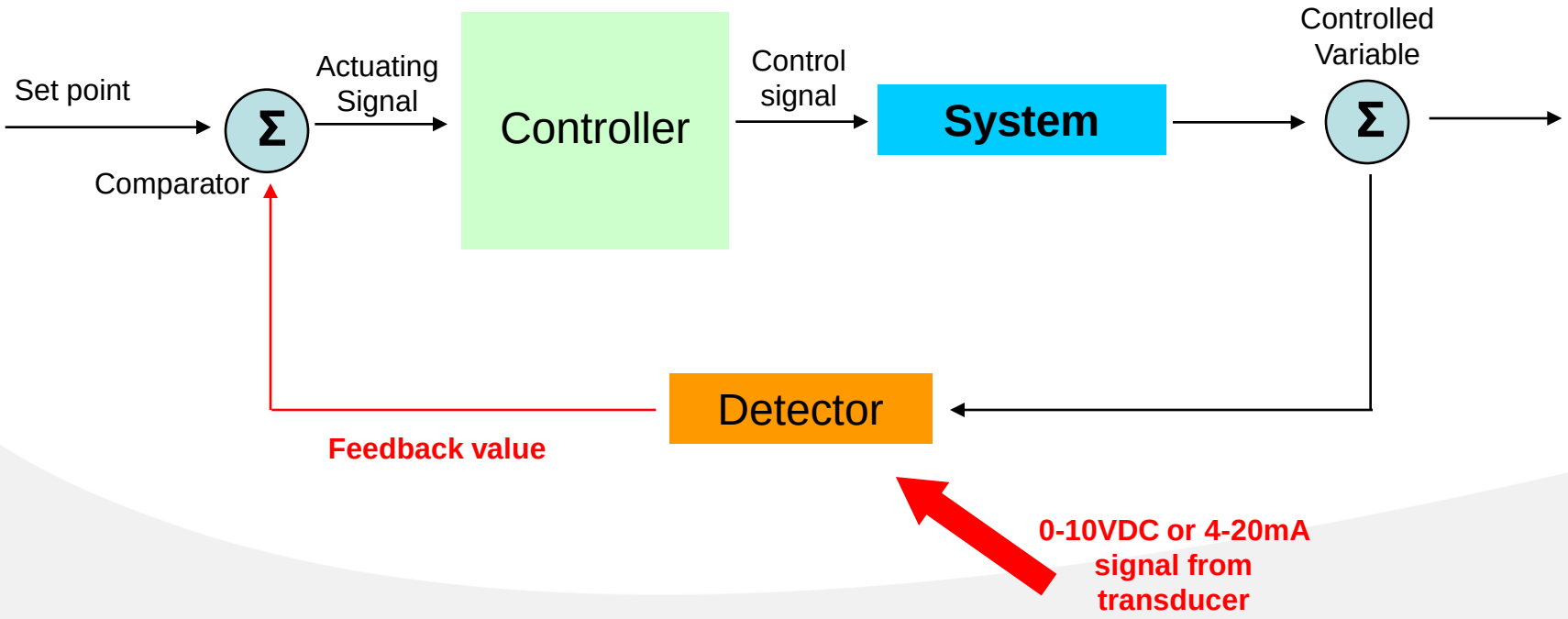
This reference is the measure of how much acid is required to be sent to the wastewater pipeline.



Multipump Application

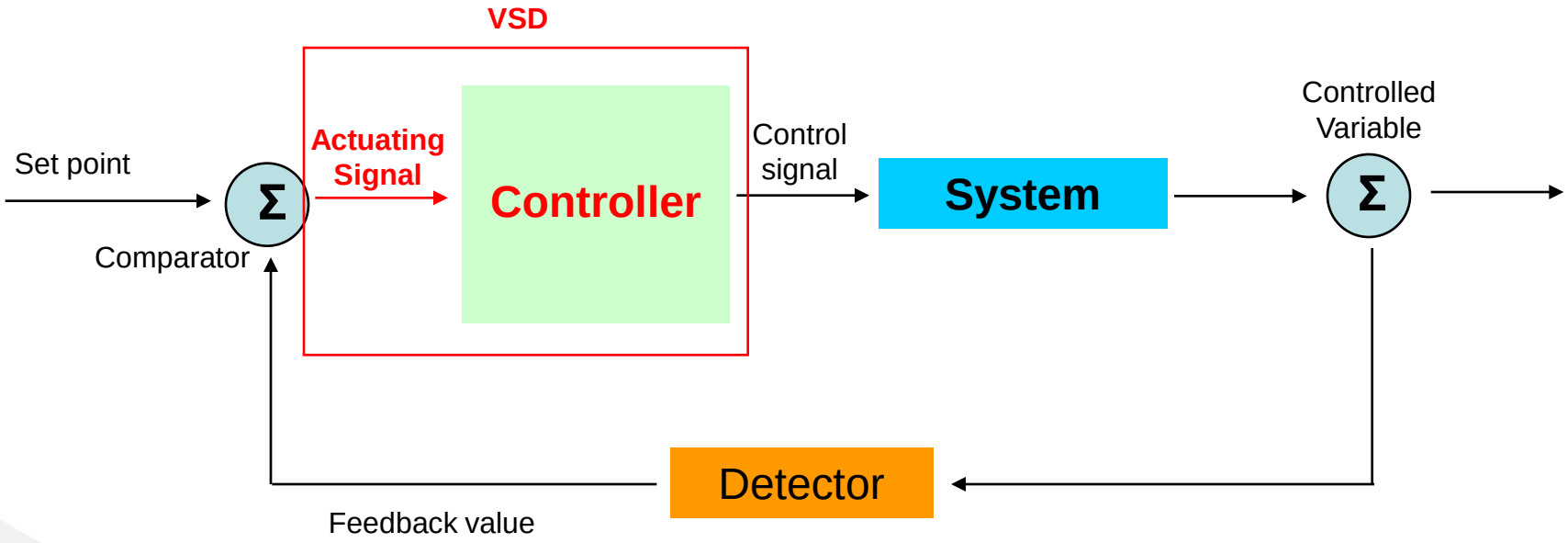
At the same time, a feedback value is received from a detector, sensor or transducer in the field.

For this example, the detector is a flow meter connected to the acid tank outlet.



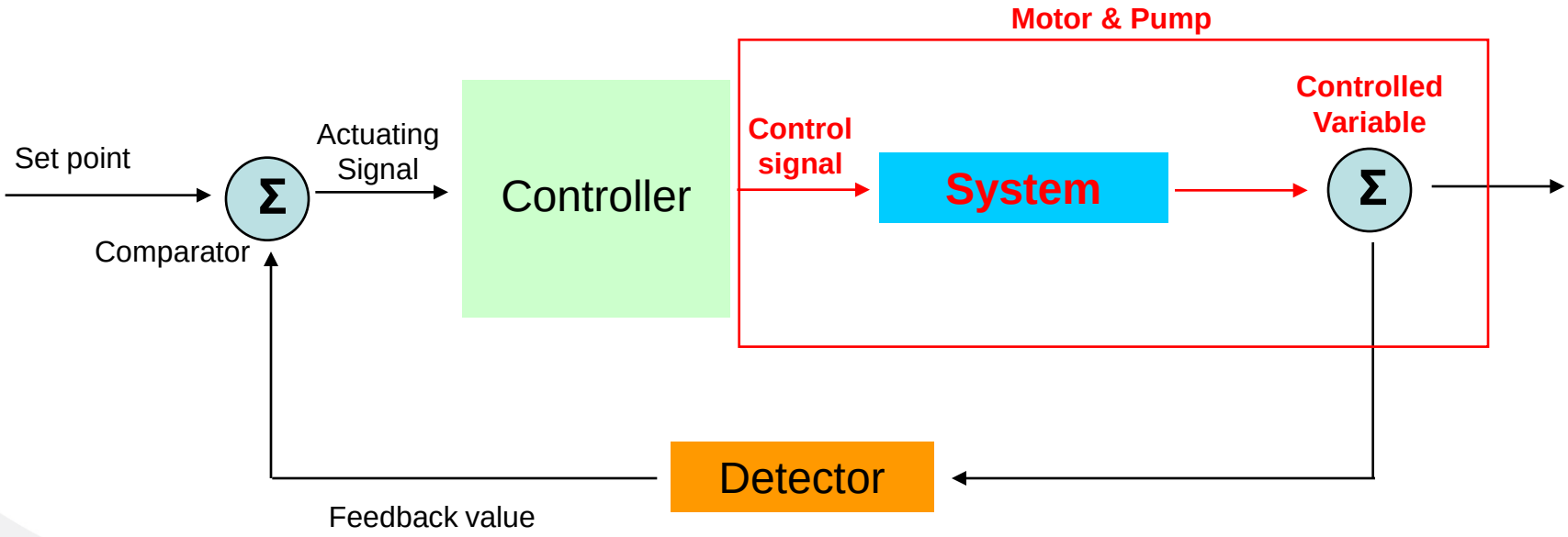
Multipump Application

The comparator looks at the set point and the feedback value and generates an actuating signal.



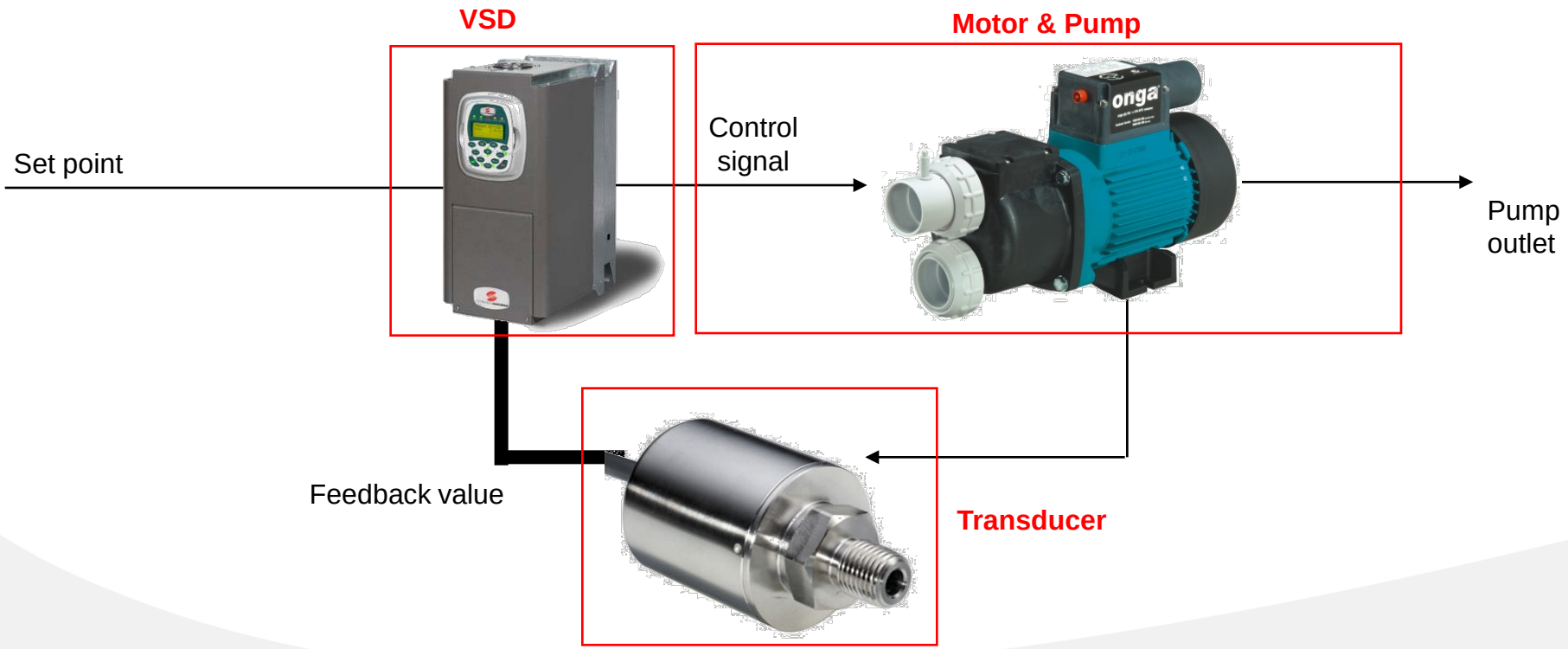
Multipump Application

Based on the actuating signal, the Controller (VSD) sends a signal to the System (the motor & pump) which adjusts the Controlled Variable (the flow rate).



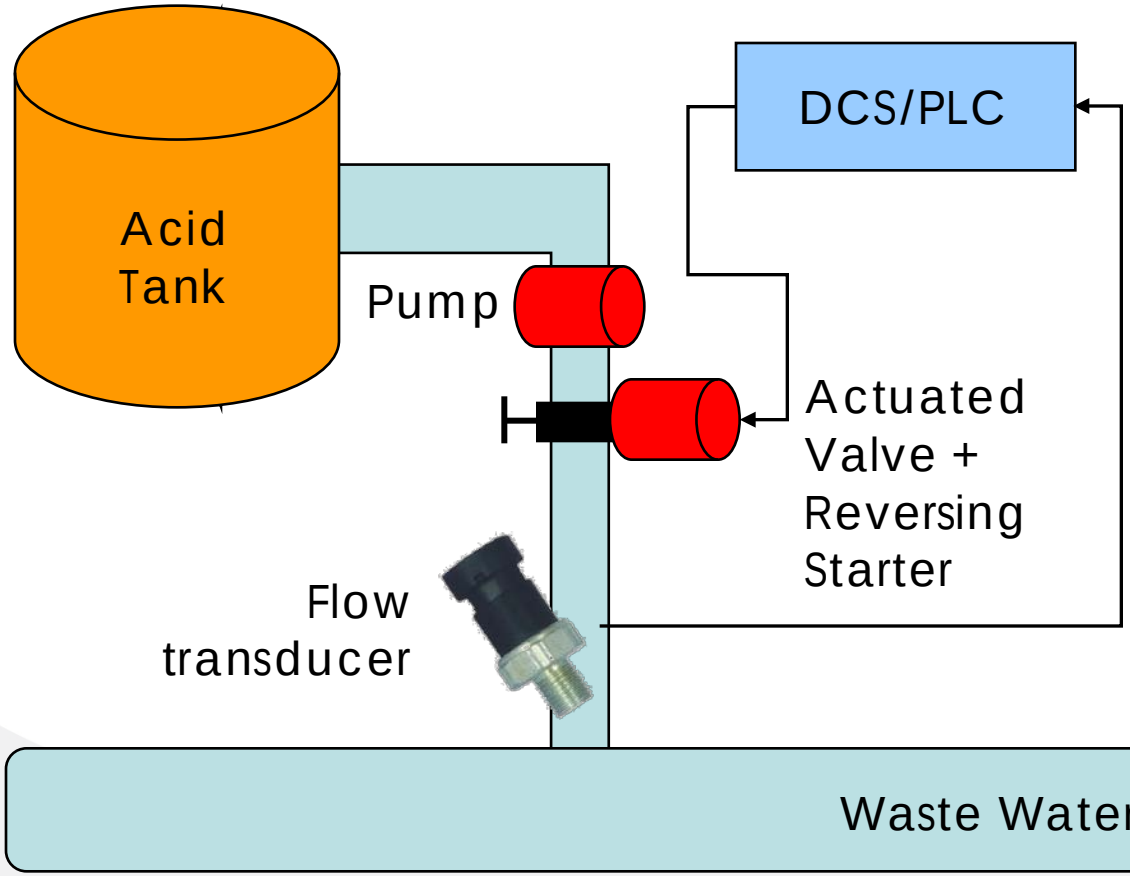
Multipump Application

Let’s now replace the ‘boxes’ with real-life components to see how the system goes together



Multipump Application

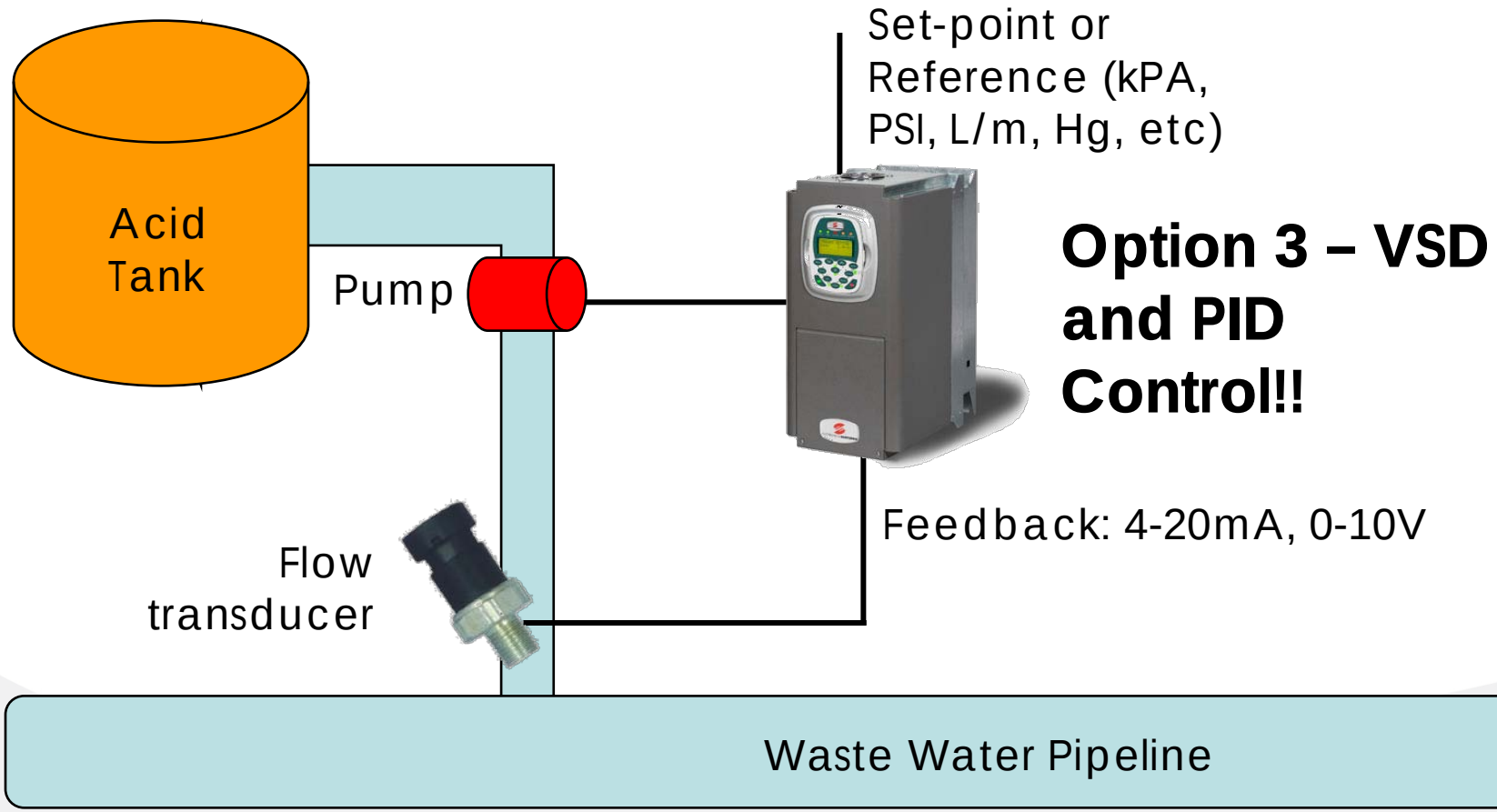
Typical application: A customer wants to control the flow rate of the acid from the storage tank into the wastewater outlet using a pump.



Option 2 – Auto flow control

Multipump Application

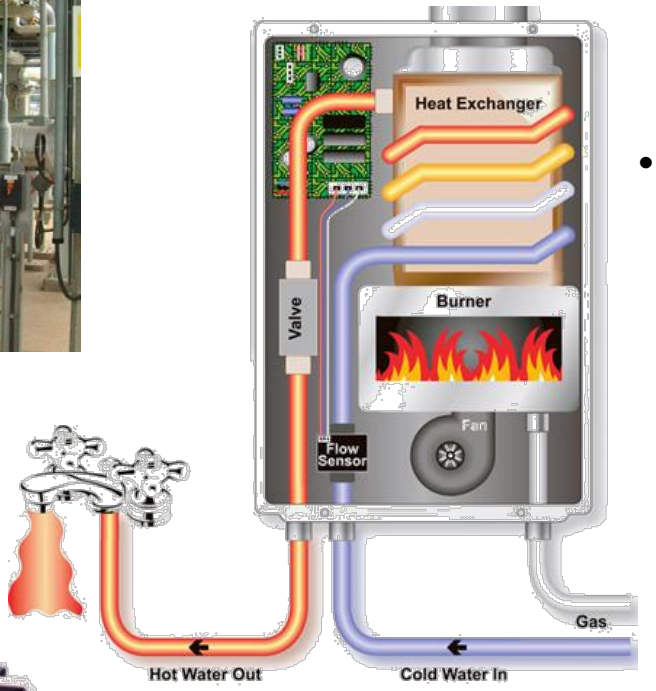
Typical application: A customer wants to control the flow rate of the acid from the storage tank into the wastewater outlet using a pump.



Multipump Application - Overview

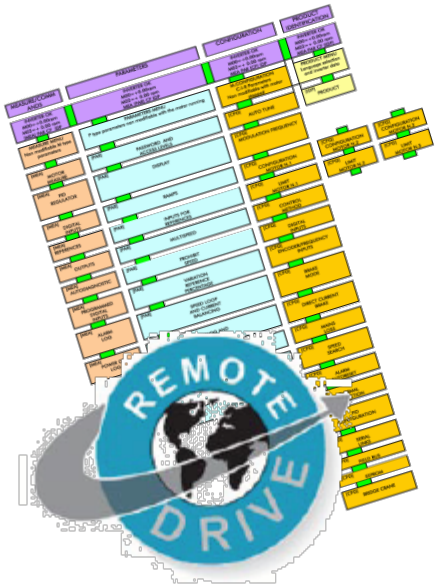
- Controls a multi-pump pumping system (up to 5 pumps)
- One pump is the speed-controlled master and the other pumps are variable speed or fixed speed slaves
- Multi-Master mode
- Connection using I/O or Modbus
- Automatic balancing of operating hours of all pump sets
- Elimination of water hammer

Multipump Application – No just pumps!



- The Multipump software can be used for any type of installation that uses a motor to maintain a constant flow (L/s), level (m), pressure (kPA), vacuum (Hg), temperature (ºC)

Multipump Application - Firmware



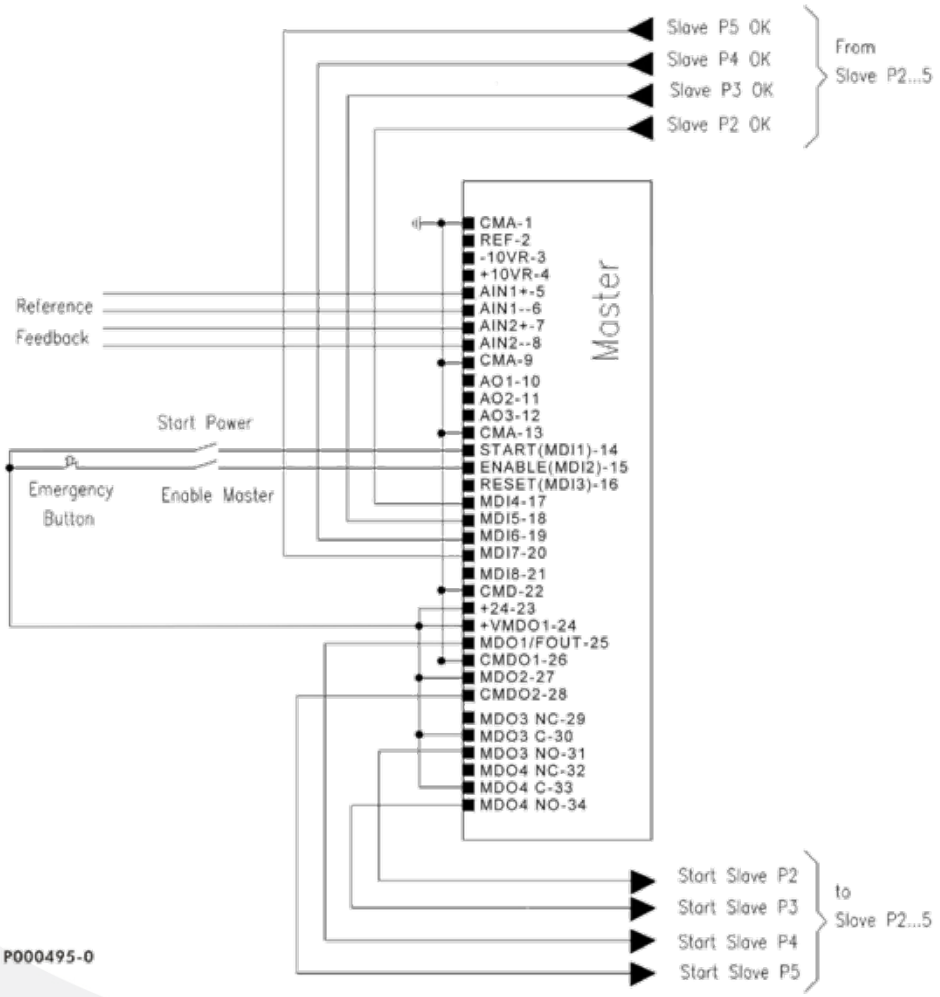
- Optional firmware package that can be used with the Sinus Penta
- Field-loadable – much like a firmware upgrade through Remote Drive
- Standard menu tree, programming mode and navigation mode of the Sinus Penta drive are used + special-purpose parameters/menus are either added/removed
- Certain parameters which are used both for the standard Sinus Penta and the Multipump application have different serial link addresses, but this does not affect their functionality, which is still the same. Mainly relates to analogue inputs and outputs.
  - Refer table 17 in the Multipump manual for a full description

Multipump Application – Fixed Speed Slaves (FSS)

- Master works continuously, turns slaves on/off as required.
- All pumps must have:
  - The same power rating (i.e 0.55kW)

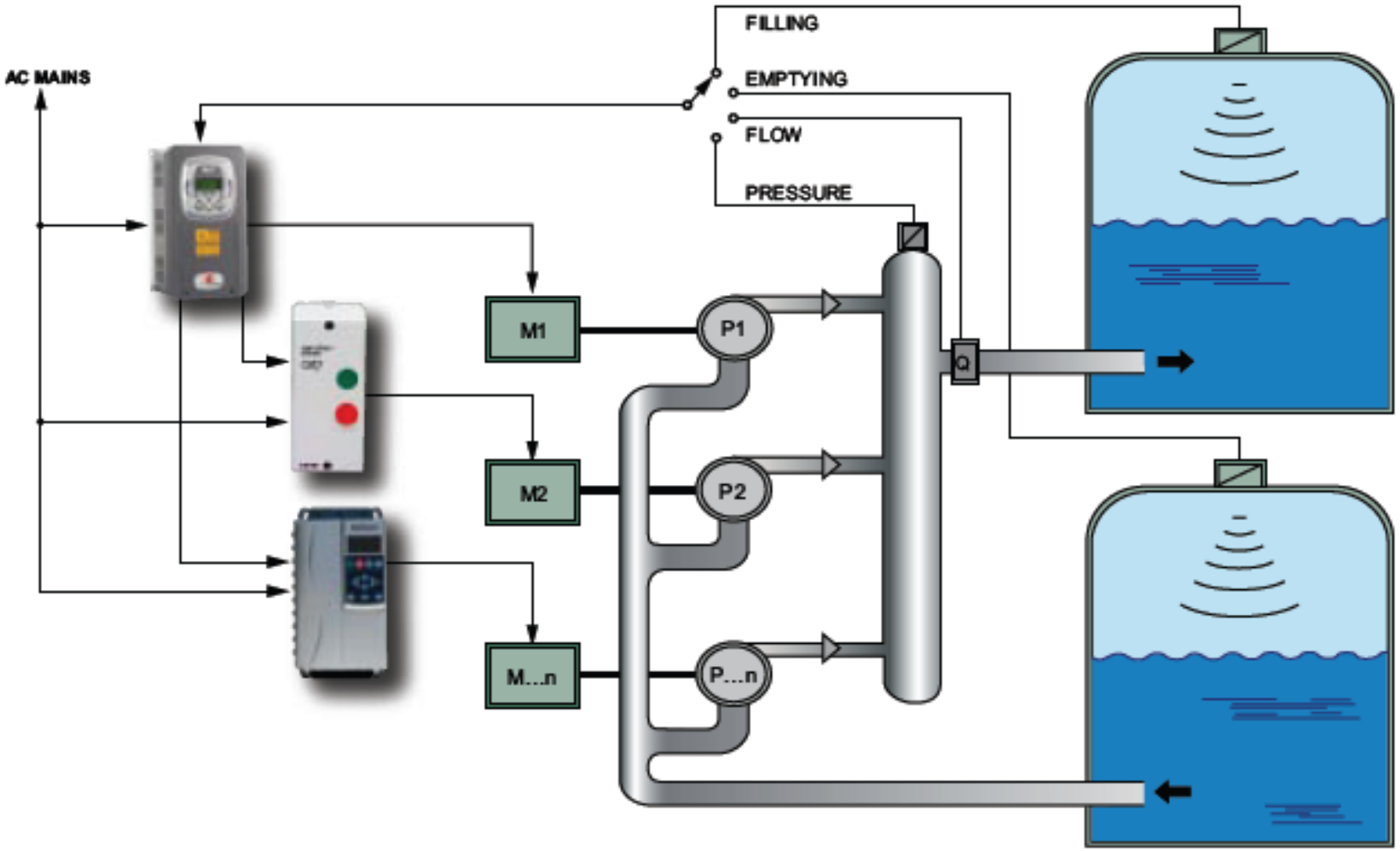
  or
  - The connected motors can have different power ratings, provided that the sum of the kW rating of the smaller motors is equal to or greater than that of the largest motor and there must be another motor the same size as the motor connected to the Master MUP drive.
- No external hardware required for:
  - Modbus (if available on slaves)
  - X2 slaves through signal connection
- Any slave device can be used provided it can provide the master with:
  - Slave ‘OK’ signal
  - Slave ‘Start’ signal

Multipump Application – Fixed Speed Slaves (FSS)

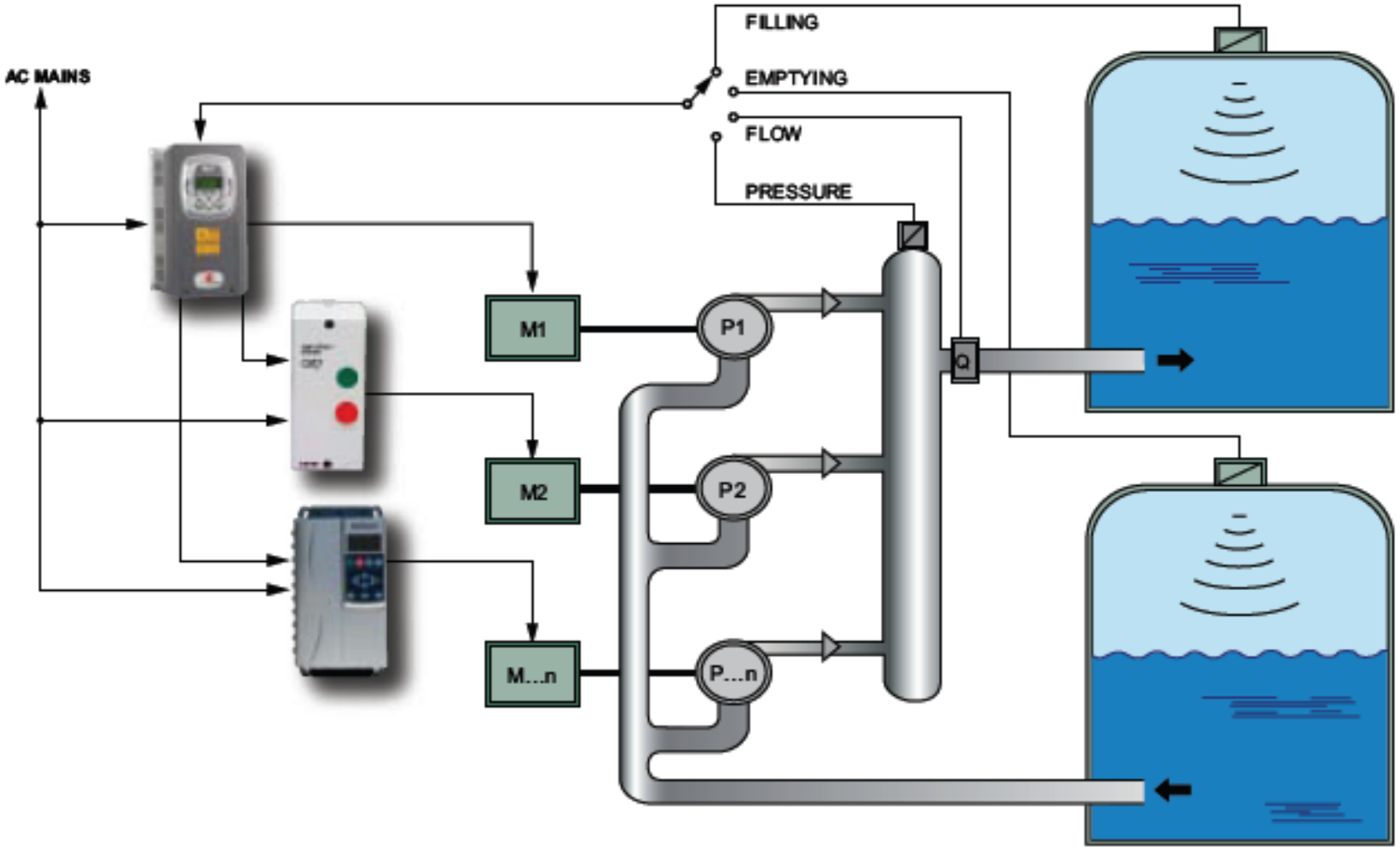


- Reference & feedback through usual analogue inputs – current/voltage
- Familiar ‘Start’ & ‘Enable’ contacts required
- Some external wiring required

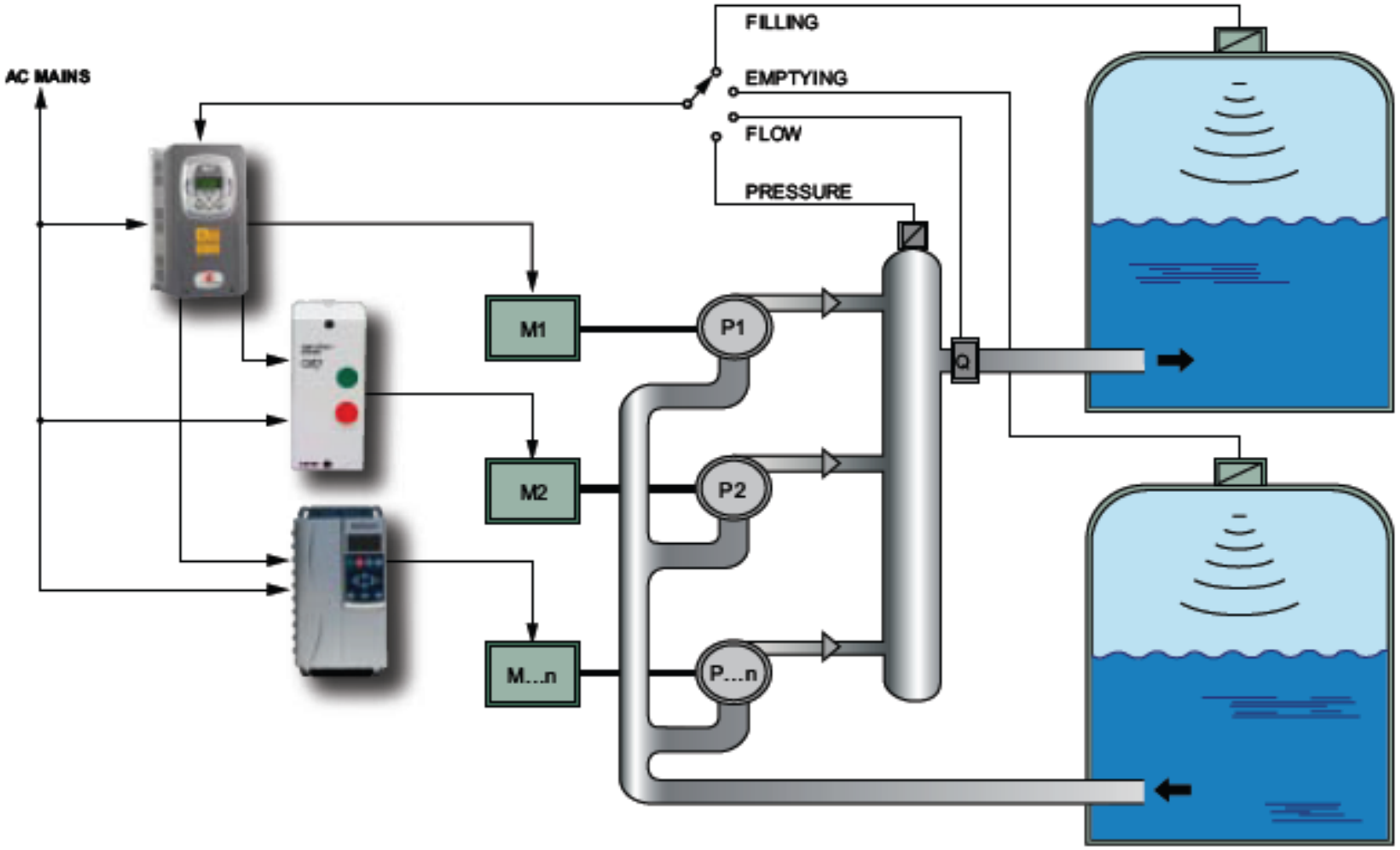
Multipump Application – Fixed Speed Slaves (FSS)



Multipump Application – Fixed Speed Slaves (FSS)



Multipump Application – Fixed Speed Slaves (FSS)



Multipump Application – Variable Speed Slaves (VSS)

- Master works continuously, turns slaves vary speed as required to meet demand of the system: pressure, flow, level, etc

- All pumps must have:
  - The same power rating (i.e 0.55kW)

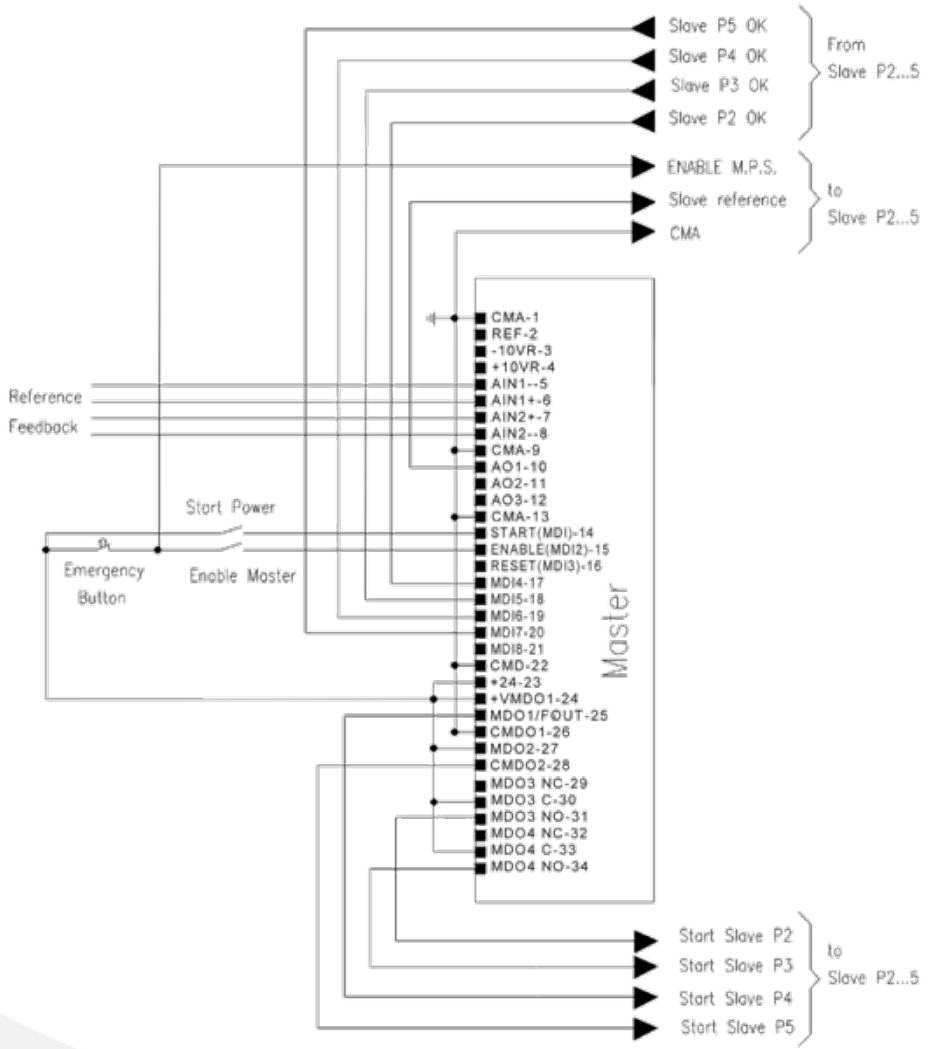
- No external hardware required for:
  - Modbus (if available on slaves)
  - X2 slaves through signal connection

- Any slave device can be used provided it can provide:
  - Slave ‘OK’ signal
  - Slave ‘Start’ signal
  - Slave ‘Reference’ signal

- If a Penta is being used as a VSS then the ‘Enable’ signal needs to be linked beween Master and Slave drives.

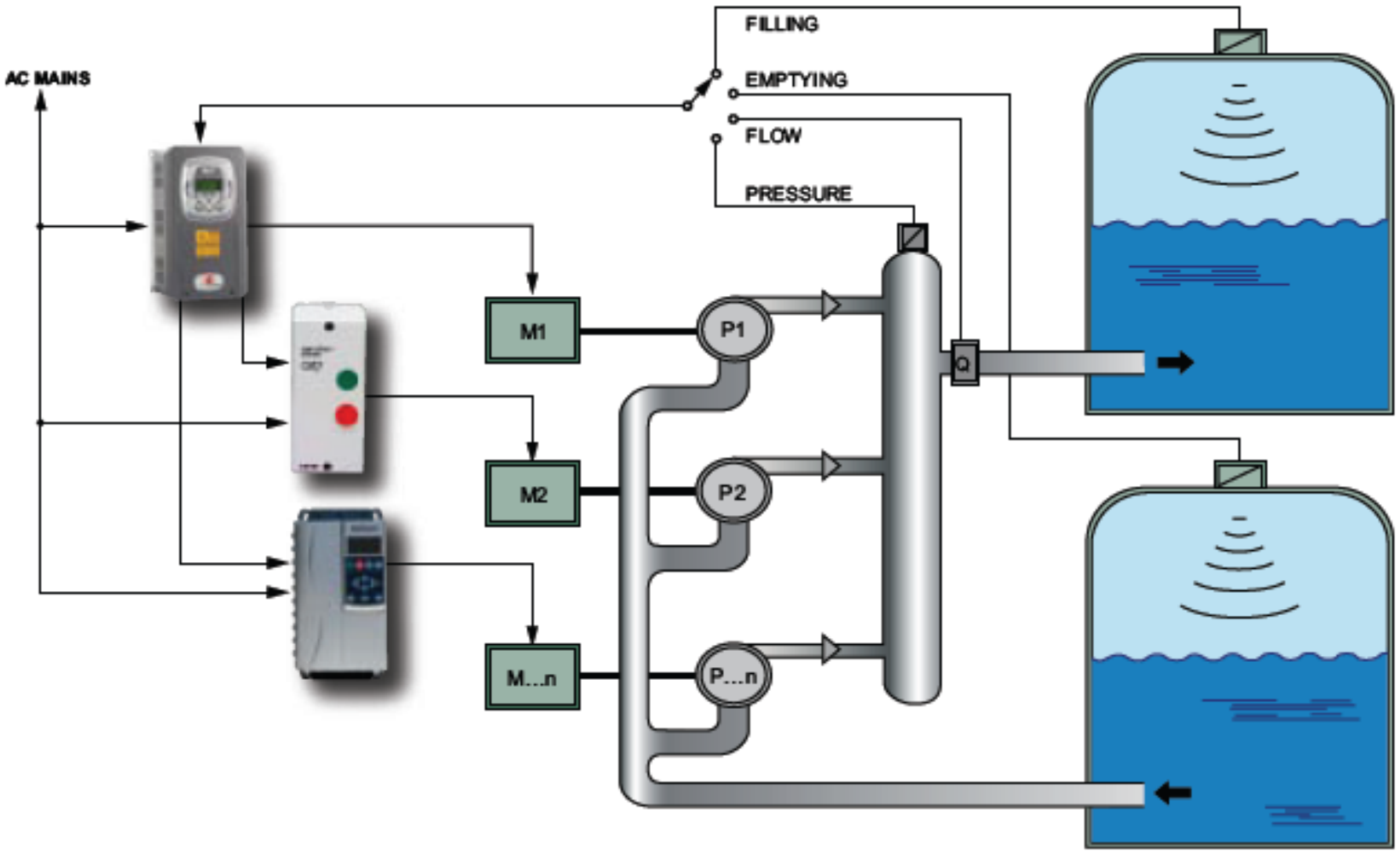
- Same signal wiring as shown with FSS installation

Multipump Application – Variable Speed Slaves (VSS)

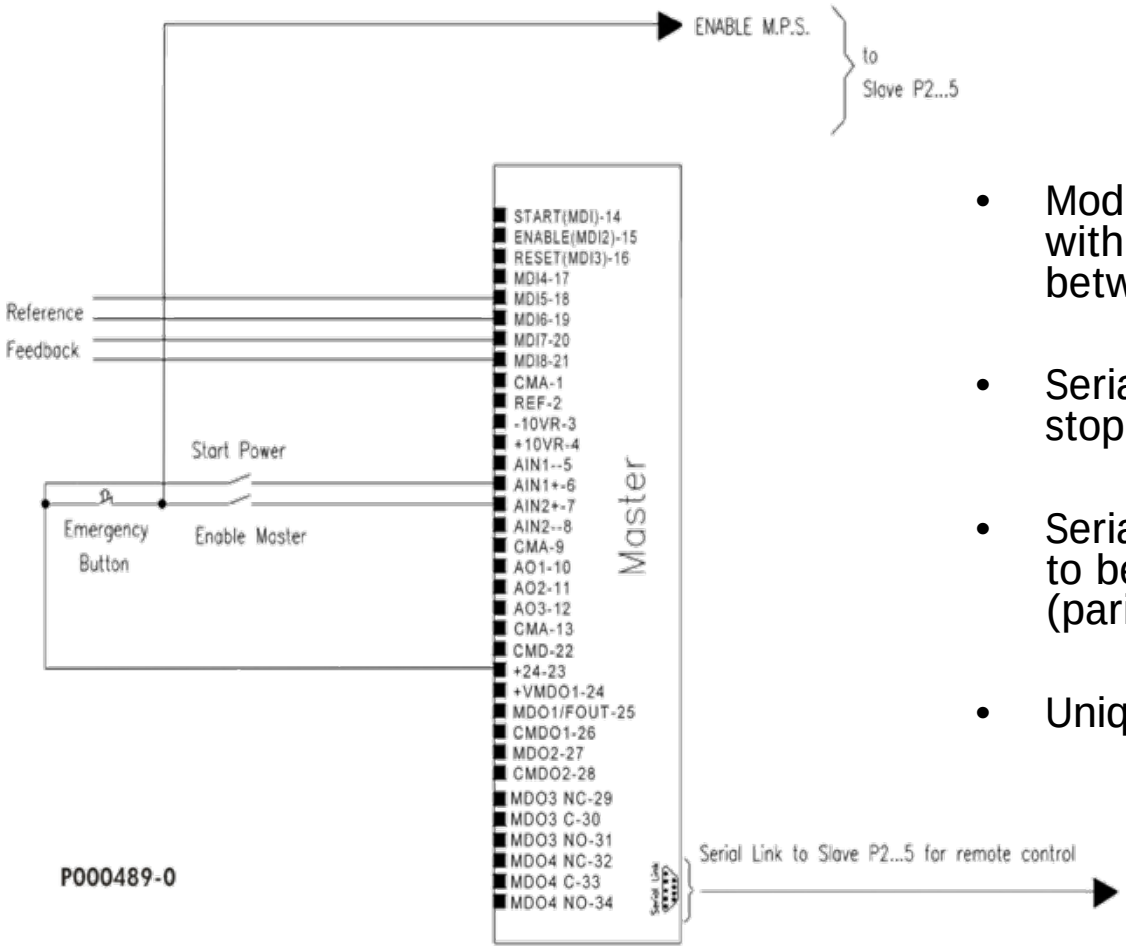


- Reference & feedback through usual analogue inputs – current/voltage
- Familiar ‘Start’ & ‘Enable’ contacts required
- Note additional
  - Enable
  - Common
  - Slave reference

Multipump Application – Variable Speed Slaves



Multipump Application – FSS & VSS Modbus



- Modbus connection is much simpler with no external wiring required between Master and Slave drives
- Serial link conveys all reference, run, stop, available signals.
- Serial communication settings need to be identical between drives (parity, stop/start bit, baud rate)
- Unique serial address for each drive

Multipump Application – Multimaster with FSS & VSS

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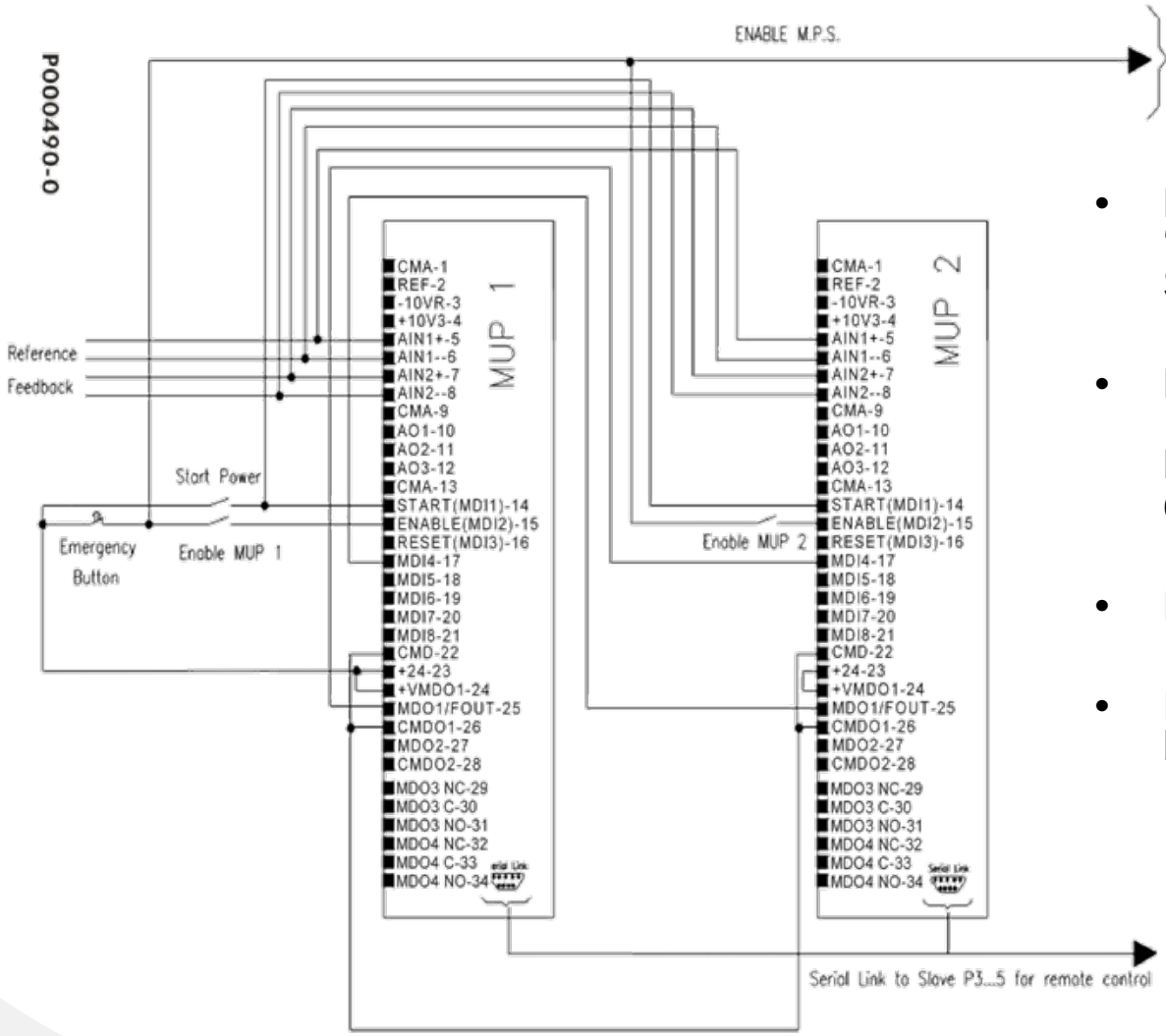
- Multimaster configuration – Primary Master & Secondary Master + Slaves
- Dual redundancy operation
- Only x3 slaves total in Multimaster configuration (x5 pumps total)
- All pumps must have:
  - The same power rating – **for VSS operation**

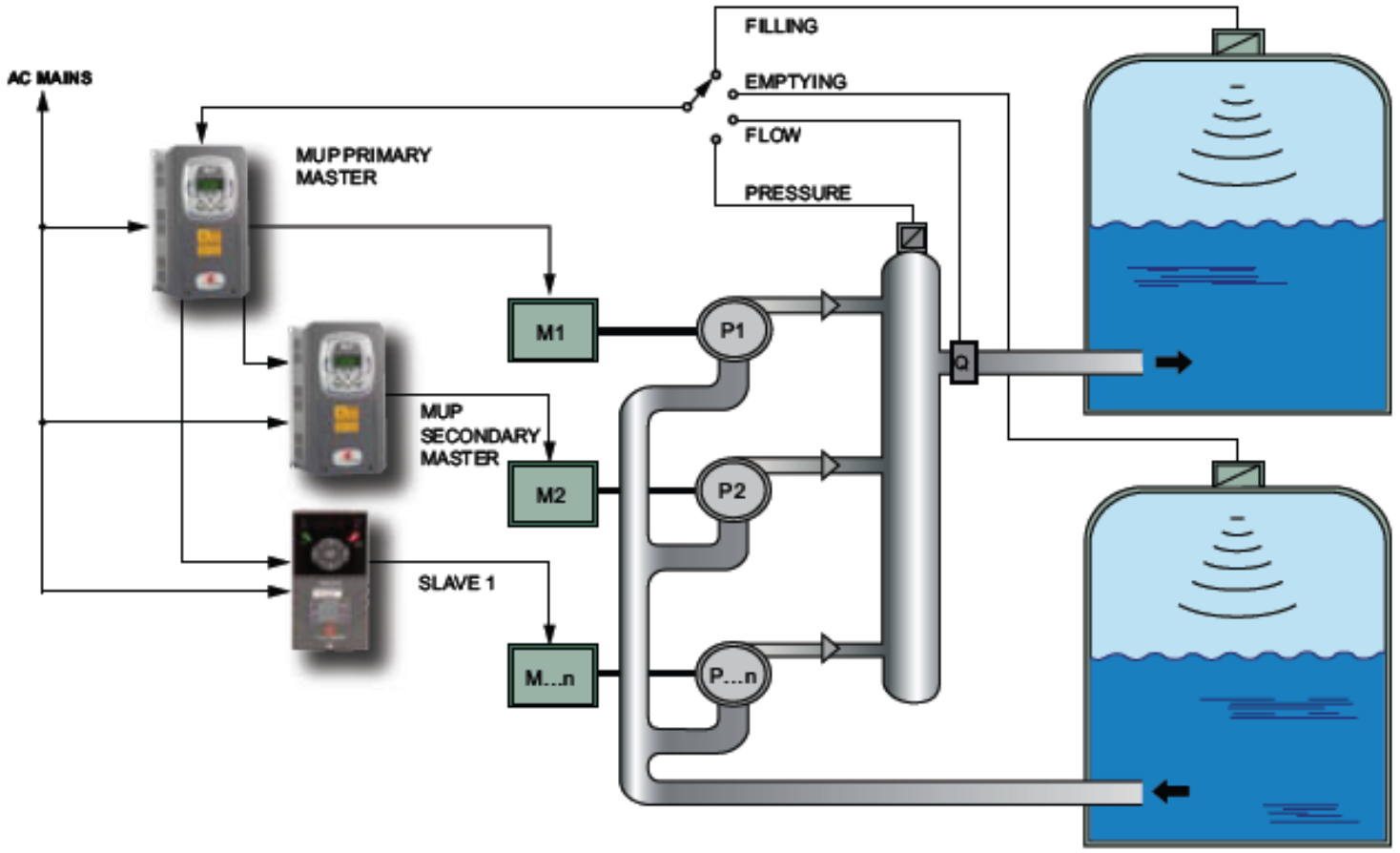
  or
  - The connected motors can have different power ratings, provided that the sum of the kW rating of the smaller motors is equal to or greater than that of the largest motor and there must be another motor the same size as the motor connected to the Master MUP drive – **for FSS operation**
- No external hardware required for Modbus connection (if available on slaves)
- Optional I/O expansion card ES847/ES870 required for signal connection.

Multipump Application – Modbus Multimaster



- Reference & feedback is ‘piggybacked’ between Primary & Secondary Master drive
- Familiar ‘Start’ & ‘Enable’ contacts required connected between Primary & Secondary Master drive
- Note additional signal wiring
- Dedicated Modbus connection between drives

Multipump Application – Multimaster FSS / VSS



Multipump Application – Experience the Drive