

Following is part 2 of James Higham's paper on an Automated Perfusion Pump.

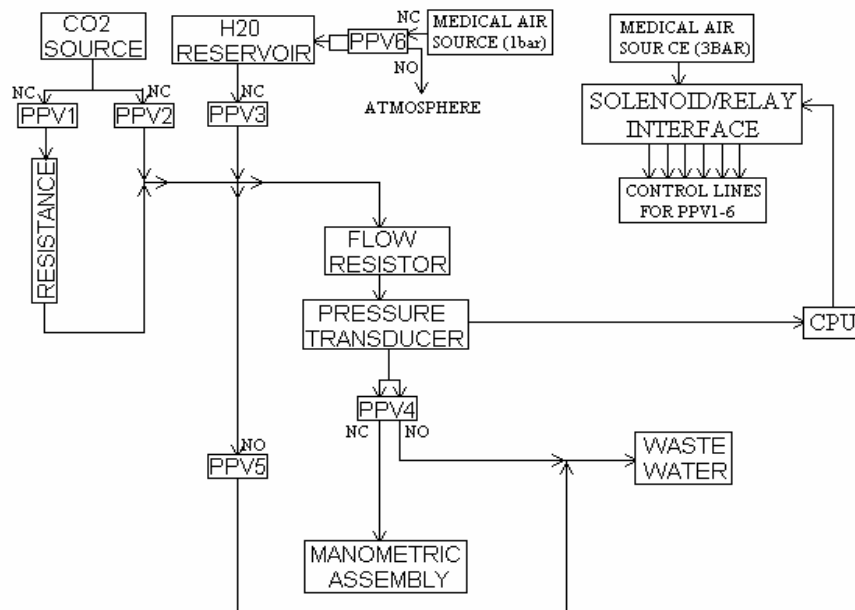


Figure 4: Construction outline for a single channel pump system. PPV1-PPV6 represent the pinch valves used.

Conclusion

At this stage all aims outlined for the pinch valves have been met. The current valve is operational with pressures of approximately 200kPa in both the control and perfusion lines, it is autoclaveable, the design is mechanically simple, normally open and normally closed positions are available in a single valve, and with the use of CNC technology it is relatively easy to manufacture.

In regards to the system as a whole the following criteria have been met:

- It is fully automated,
- There are appropriate safety mechanisms,
- The system has minimal compliance,
- Channels are electrically isolated from each other,
- It is relatively cheap,
- The channel spacing is approximately 1.5cm, and
- It is relatively simple to use.

The following criteria have not been met:

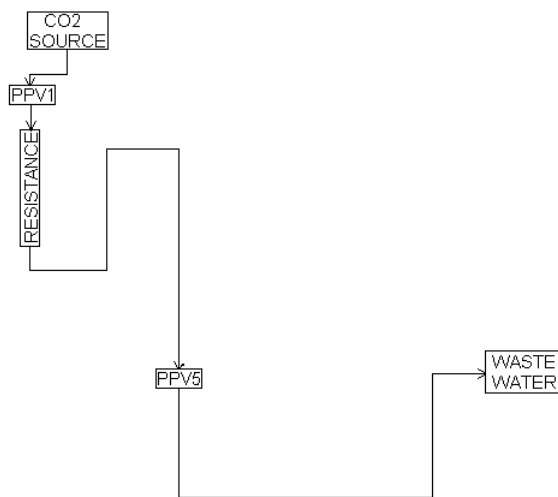
- There is no mechanism to indicate that the reservoir has run out of water- this can easily be incorporated using a liquid level sensor and an appropriate interface with the controlling software,
- N-channel arrangement not permissible- the channels have not been constructed as individual units however a redesign of the overall system could allow for this,
- The transducers are not calibrated automatically- this can be incorporated using an appropriate software routine.

The issue of conformation to the relevant Australian safety standards will need to be fully addressed in the near future.

A new 32-channel system has been constructed based on the success of the 22-channel system for delivery to researchers based in Zurich, Switzerland, in mid January 2001. This system is shown in figure 6.

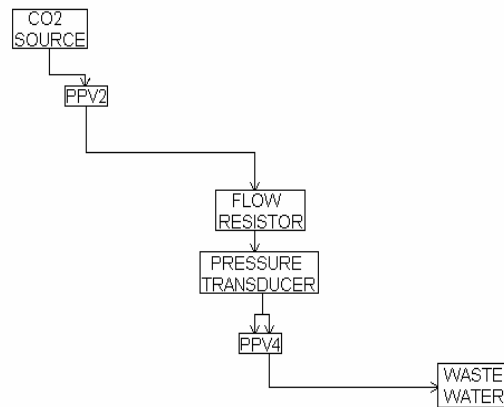
Acknowledgements

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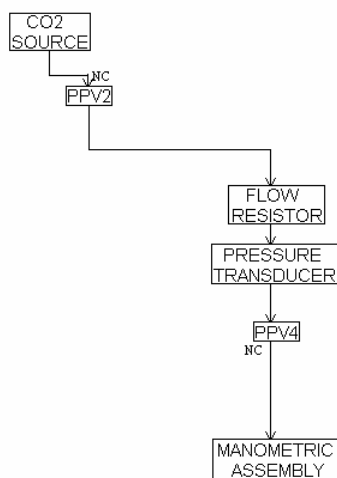
5a. The manifold is flushed with CO2 via a resistance to remove any air, the resistance controlling the flow rate of the CO2 delivery.

activated PPV1
deactivated PPV2-6



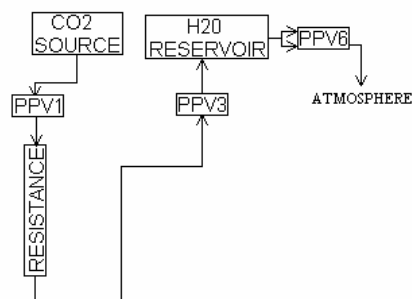
5b. CO2 perfused through to the waste water to remove the remaining air from the channel and manifold line.

activated PPV2 PPV5
deactivated PPV1 PPV3-4 PPV6



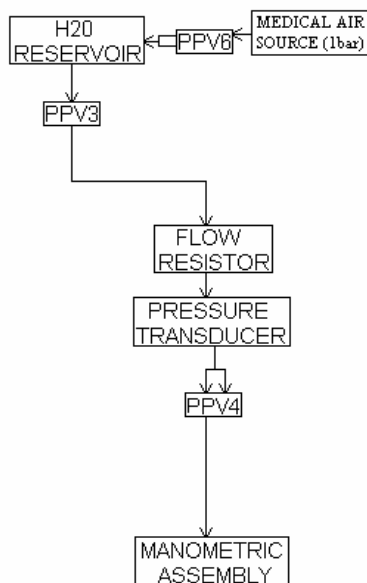
5c. Assembly is flushed with CO2 to remove all air from the remainder of the channel and assembly.

activated PPV2 PPV4-5
deactivated PPV1 PPV3 PPV6



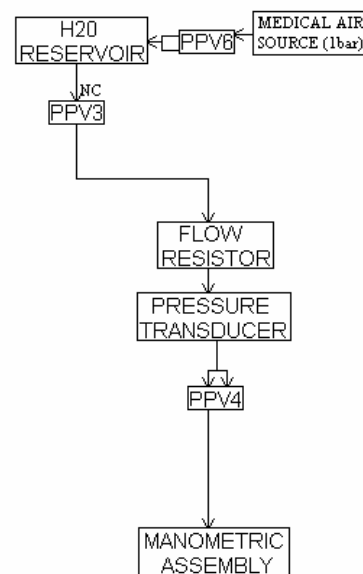
5d. Water line backflushed with CO2 via a resistance to remove air from the water line. The resistance ensures minimal turbulence is produced in the reservoir.

activated PPV1 PPV3 PPV5
deactivated PPV2 PPV4 PPV6



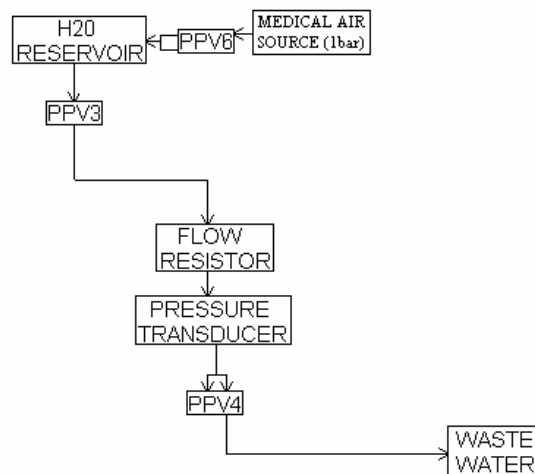
5e. Water is perfused through the assembly to absorb the CO2 in the channel and assembly.

activated PPV3 PPV6
deactivated PPV1-2 PPV4-5



5f. The assembly is perfused with water to absorb the CO2 in the channel and assembly.

activated PPV3-6
deactivated PPV1-2



5g. Water is perfused through to the waste water to absorb the remaining CO₂ from the channel and manifold line.
 activated PPV3 PPV5-6
 deactivated PPV1-2 PPV4

Figure 5: Figures 5a-5g outline the basic setup configuration for the system.

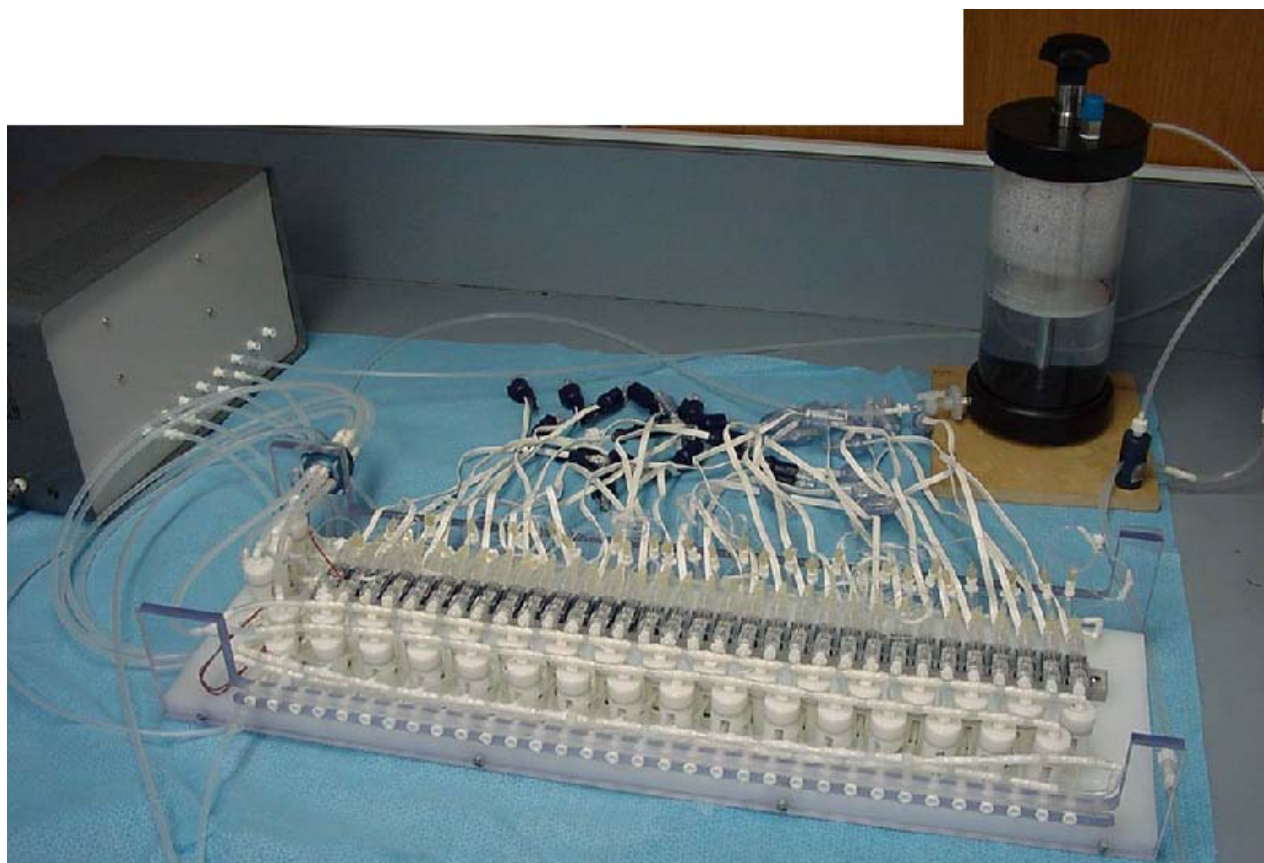


Figure 6: 32 channel system with reservoir (top right) and control box (top left) housing the solenoid/relay interface.