



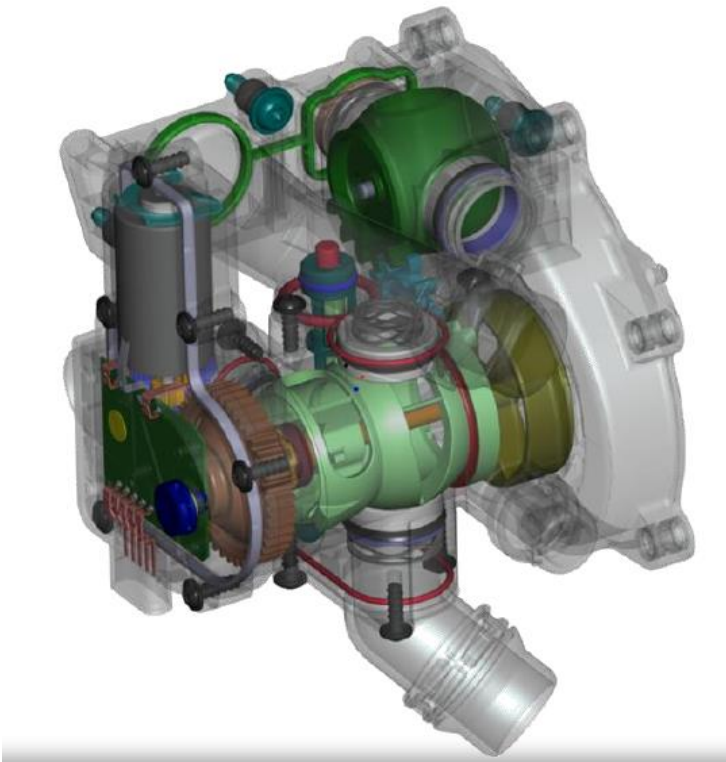
Serving The Worldwide Transportation Industry

Thermal Management

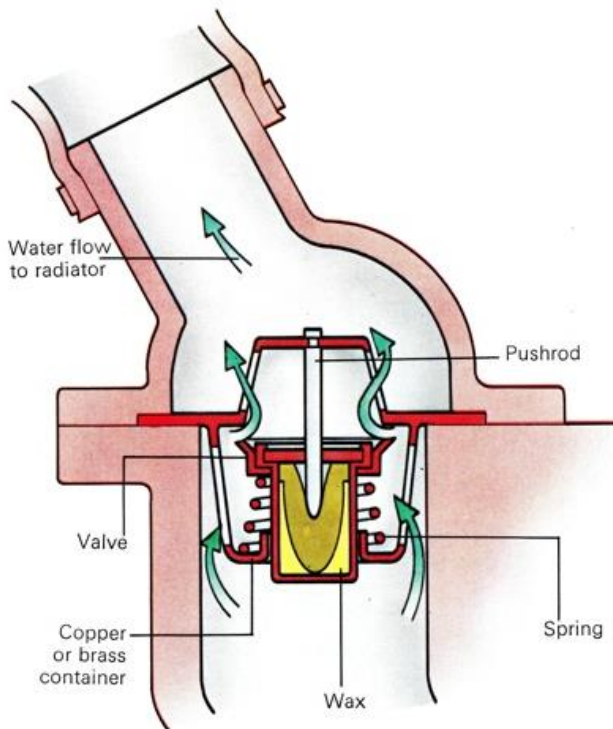
- **Potential CO2 reduction between 1.5 and 3%**
 - Temperature accuracy
 - Temperature flexibility – on demand management
 - Multi temperatures zones
 - Coolant flow management for peripheral components (intercooler, EGR, waste recovery, oil cooler, etc.)
 - Flex fuel engines requires temperature flexibility

Thermal Management

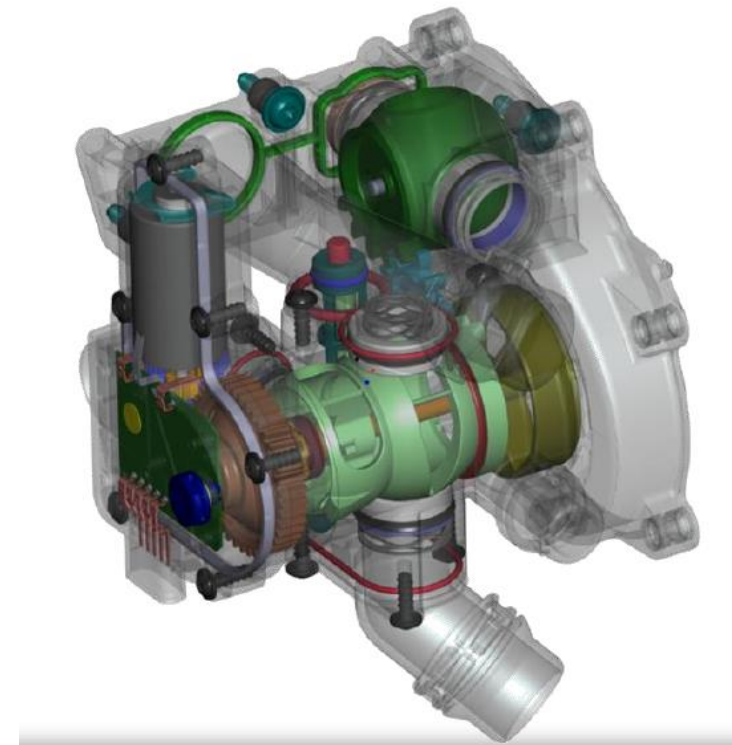
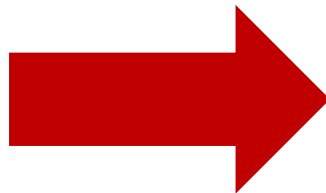
Ball valve solution



Something between

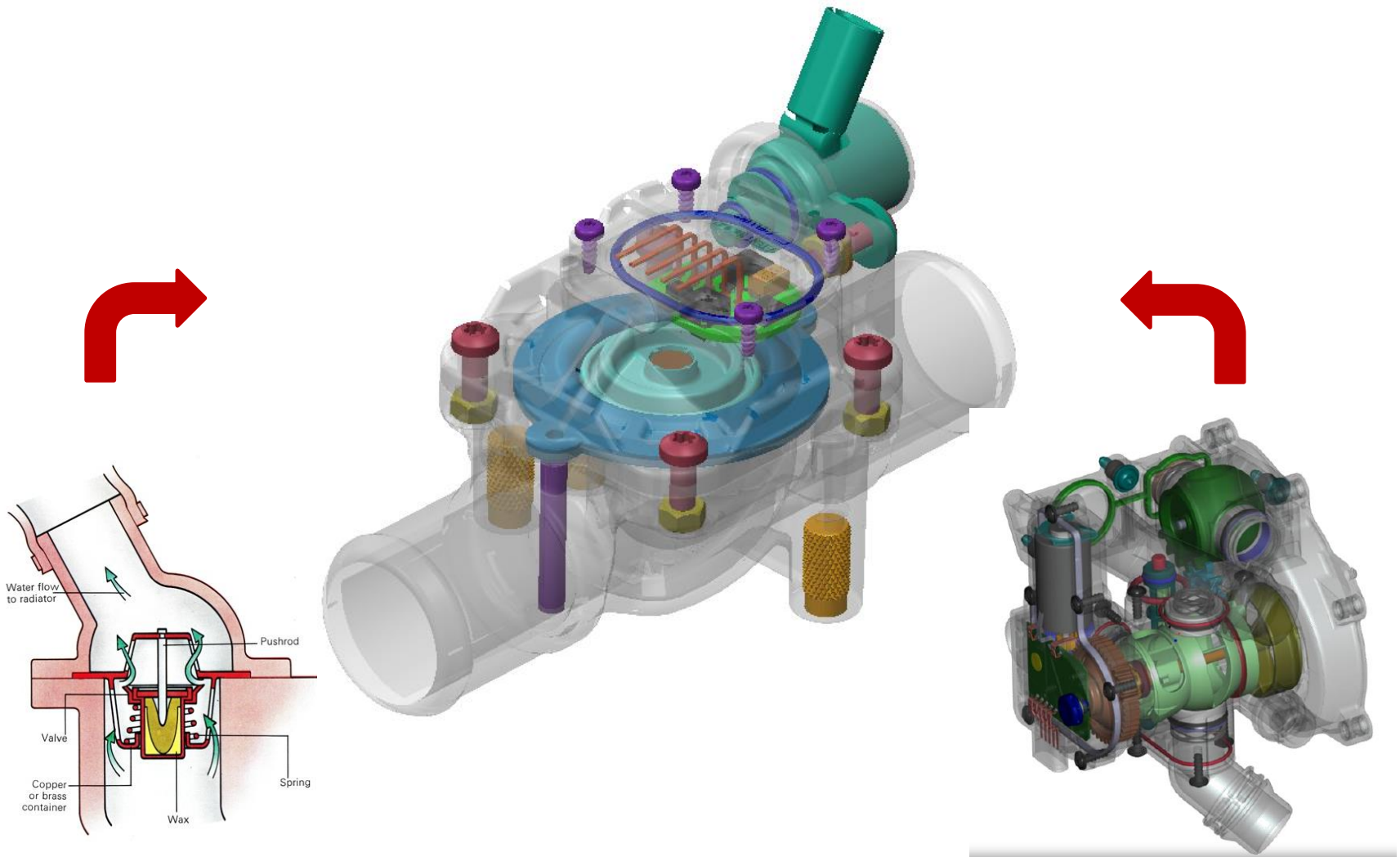


Wax valve



Ball valve

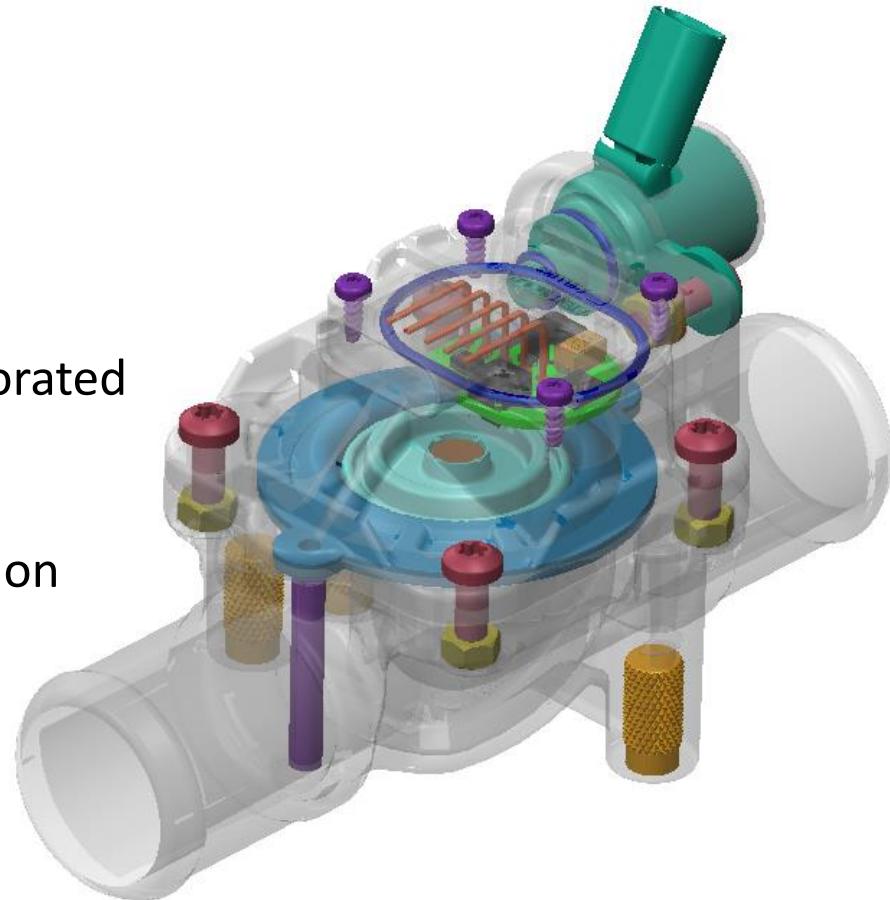
Diaphragm valve



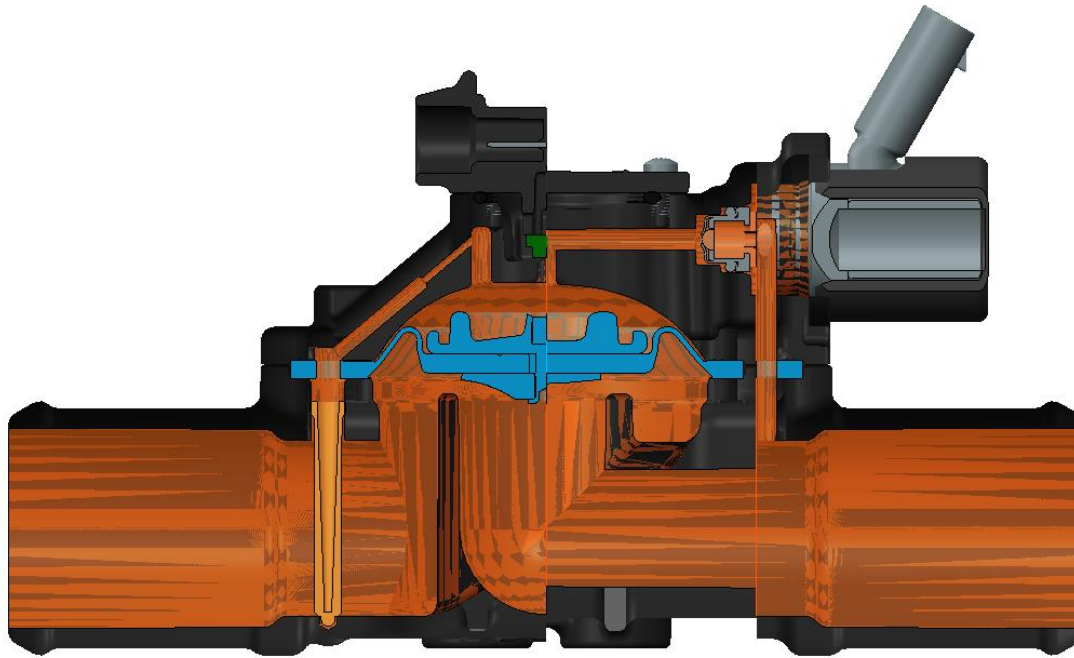
Diaphragm valve

Main characteristics:

- Hydraulic powered
- Low pressure drop
- Layout flexibility
- Lower power consumption - 9.6 Watts
- Feedback sensor or full controller incorporated
- Control : PWM - LIN – CAN
- Normally open design for fail safe operation
- Weight: 385 grams (1" valve size)

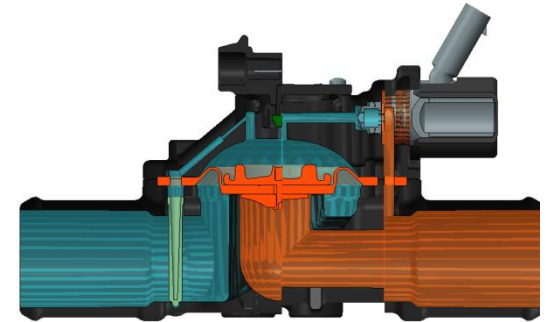


Hydraulic Powered

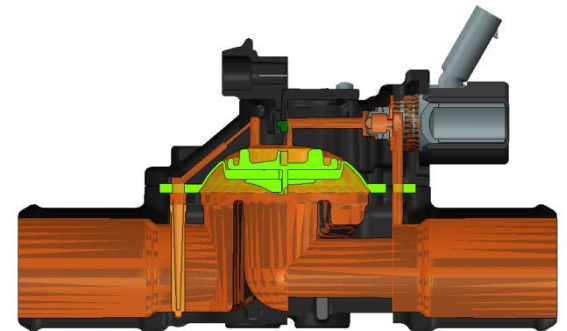


Flow direction

Totally closed
12 volts applied

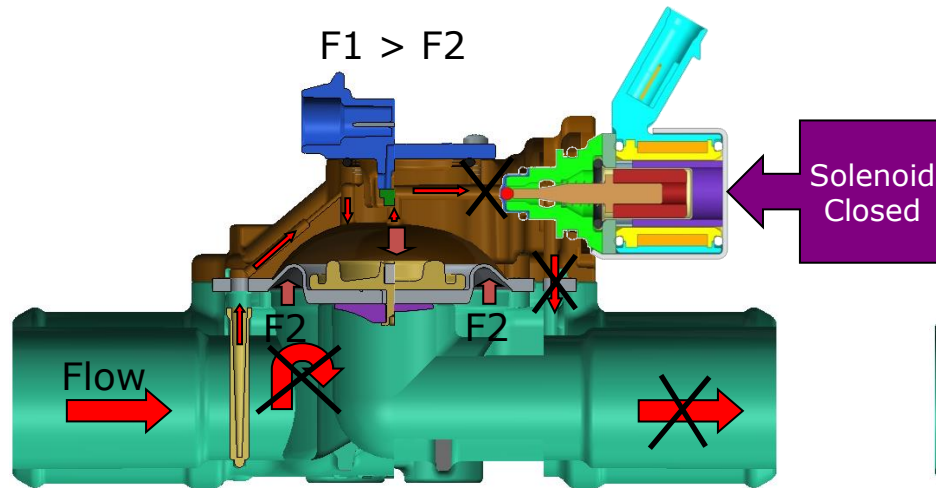


Totally opened
Zero volts applied



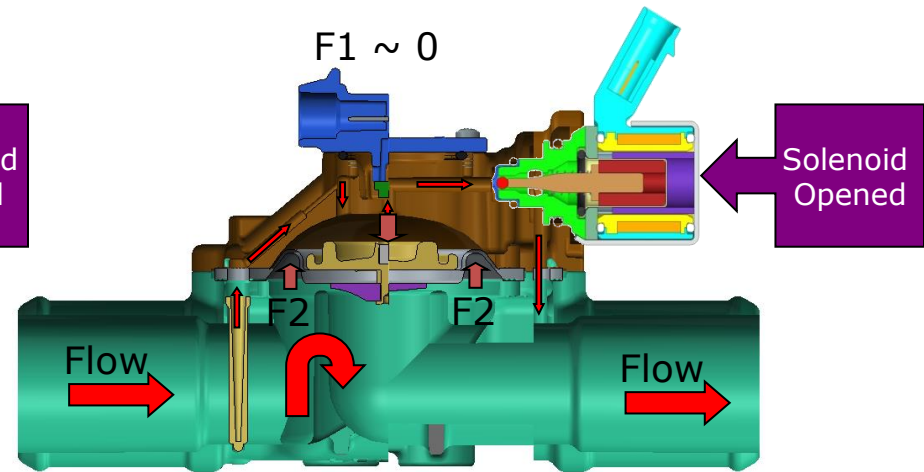
Working Concept

12V - Valve Closed



$F1 > F2$ - Valve Closed

0V - Valve Opened



$F1 < F2$ - Valve Opened

By switching the solenoid (PWM signal) we can control output flow according engine needs.

Layout Flexibility

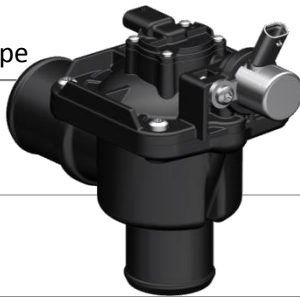


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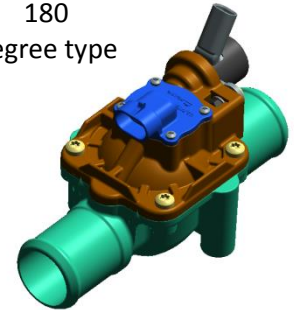


Pressure Drop

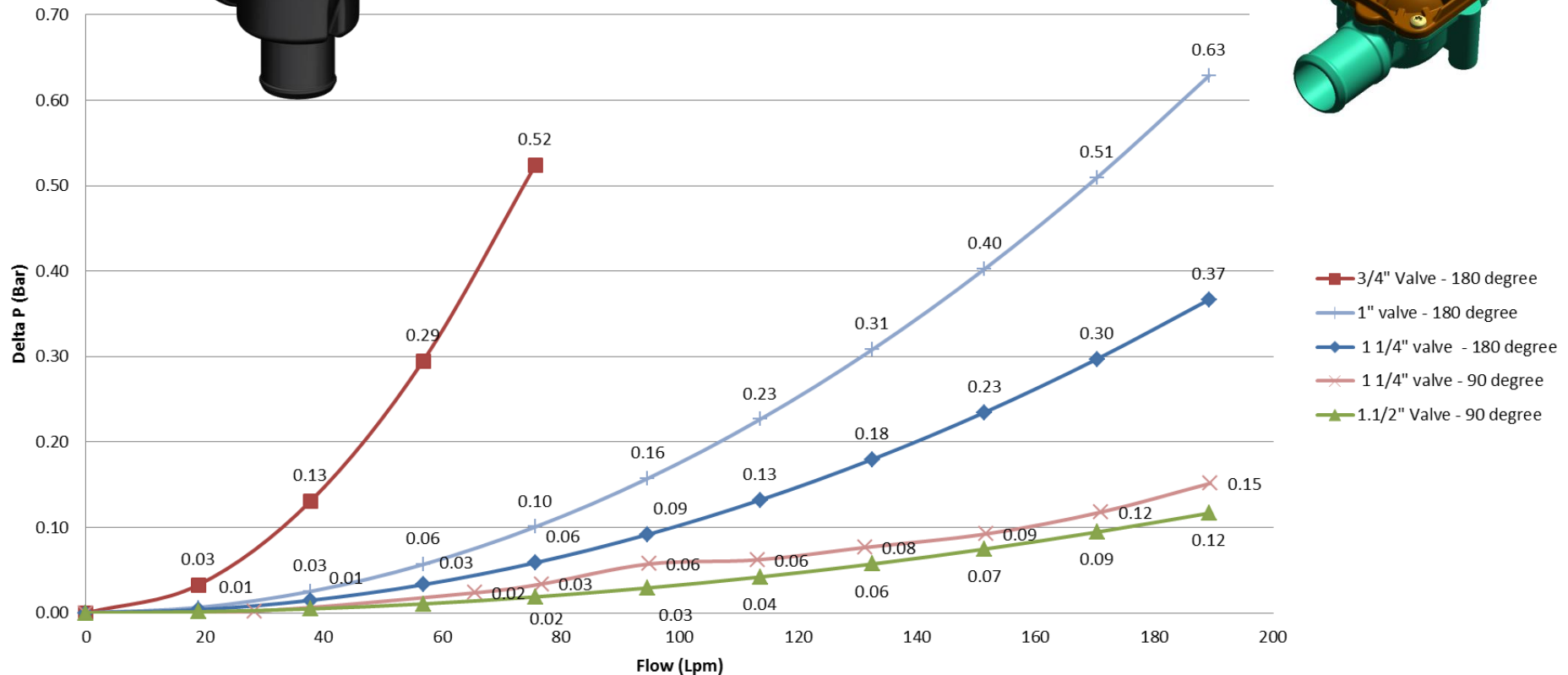
90
degree type



180
degree type



Coolant control valve - Flow x DeltaP
Fully open valve



Simple



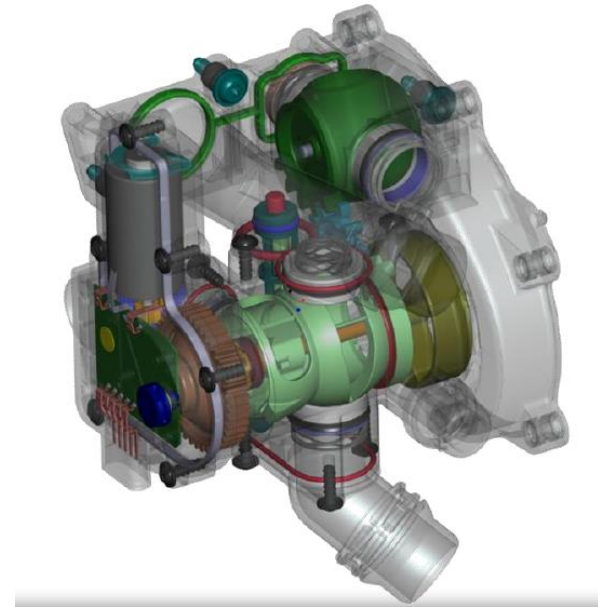
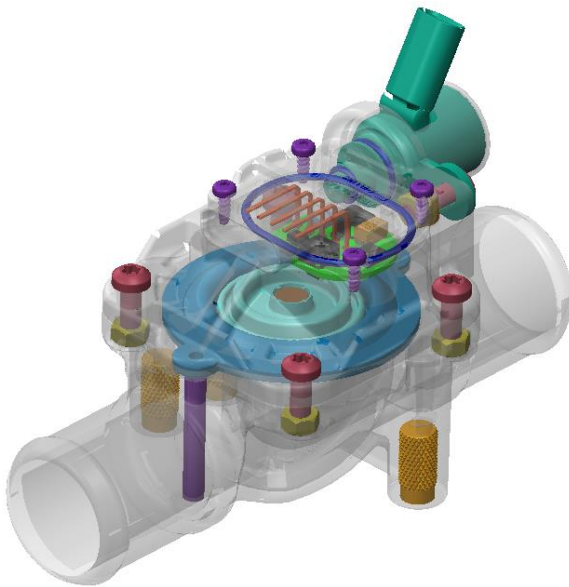
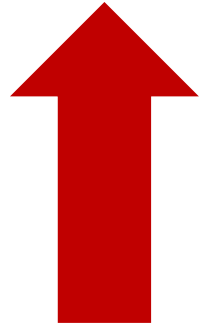
~~Motor
Gears
Springs
Shaft~~

Reliable

- Real fail safe
- No friction components
- Rubber as the sealing material
- Filter to protect the solenoid valve

Cost Comparison

**30 to 40%
Higher**



Thank you!

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