To Predict ▶ To Design ▶ To Perform

College of Engineering
Department of Mechanical & Industrial Engineering

ME, ECE, BE Capstone Design Programs

Team 27: Mechanical Operation of the FMC Choke Throttle Valve

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FMC Technologies

Objective Statement

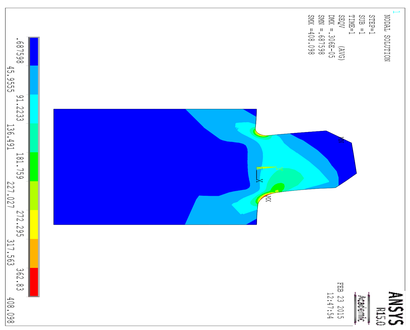
Team 27 will design a valve attachment that will remotely actuate the functions of FMC Technologies' proprietary Flowline Choke Throttle valve. The design will streamline valve operations and always operate the valve in the correct sequence.

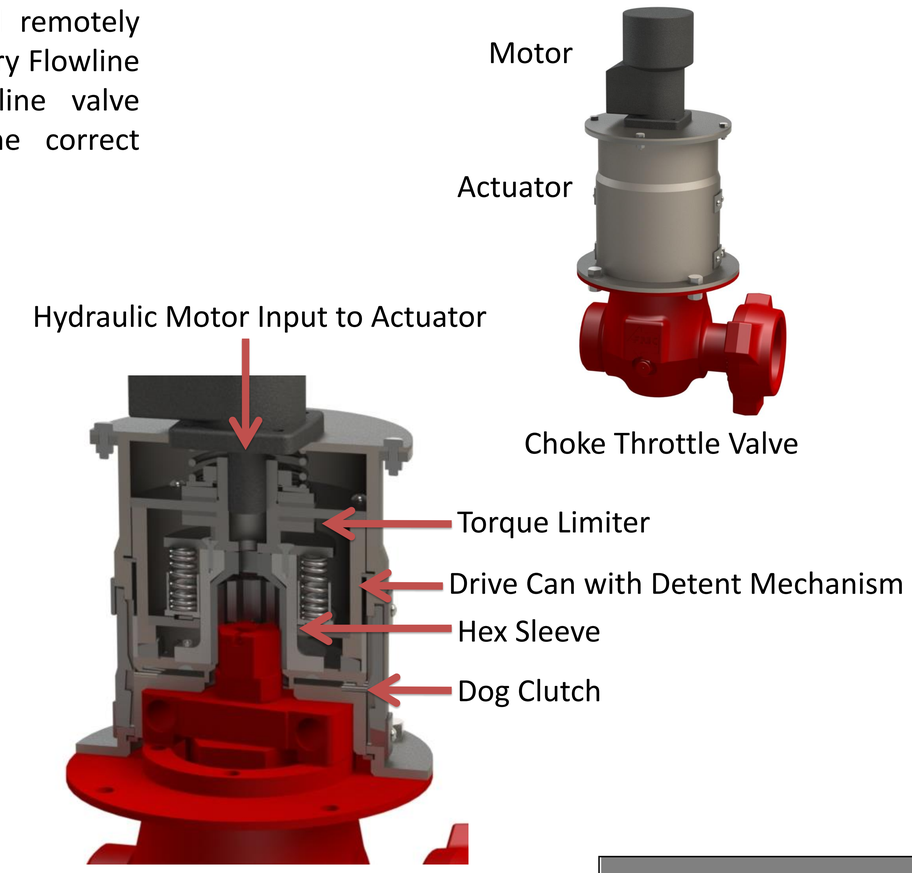
Engineering Specifications

- Only allow for operation of the valve in the correct order.
- Be able to output 150 foot-pounds of torque.
- Be environmentally sealed.
- Target weight of 50 pounds
- Last at least 1000 actuation cycles.
- Must turn ¼ turn for choke valve.
- Must make 5 revolutions and rise .95 inches for throttle valve.

Operational Principles

- Which function the actuator is turning is controlled by a detent system.
- The switching between the two functions of the actuator is torque-controlled rather than distance-controlled.
- The detent is used to ensure the proper operating order.





FEA

- Completed for critical components (detenter, clutch teeth).
- Lowest Factor of Safety found was 6.21.
- Loads based on fixed geometries and 150 ft-lbs torque input.
- ANSYS (shown at left) was used to determine deflections and stresses on a micro-scale.

Budget	
Total Available Budget	**$1,500.00**
Raw Materials	$431.86
Stock Parts	$436.20
Hydraulic Motor	$267.68
Shipping	$158.83
Total Supply Cost	**$1,294.57**
Remaining Budget	**$205.43**

Manufacturing

- Parts manufactured out of low carbon steel.
- Machining methods used were CNC lathe or CNC mills as recommended by LSU machine shop technicians.
- Tolerances of 1 to 2 thousandths of an inch were required for sliding parts.
- Standard tolerances of 5 thousandths of an inch were used unless otherwise specified.

Testing Results

- The actuator was successfully able to transmit 150 foot-pounds of torque and open and close an unpressurized valve.
- The actuator operated in the correct order.
- The final design left an input for remote actuation.

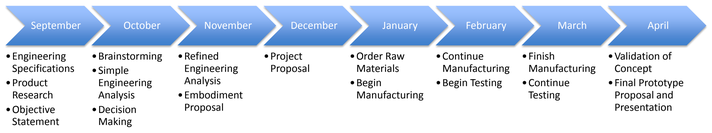
Safety

- The actuator incorporated a torque limiter to prevent the transmission of any torque over the maximum of 150 foot-pounds.

Budget

- Were the prototype designed for mass production, the per unit cost would actually be around $1300, inclusive of a motor.

Schedule



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