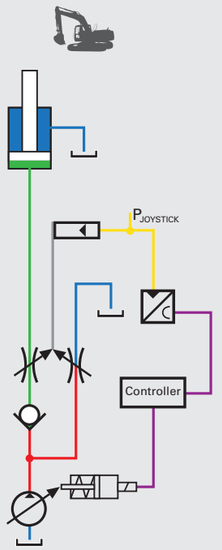
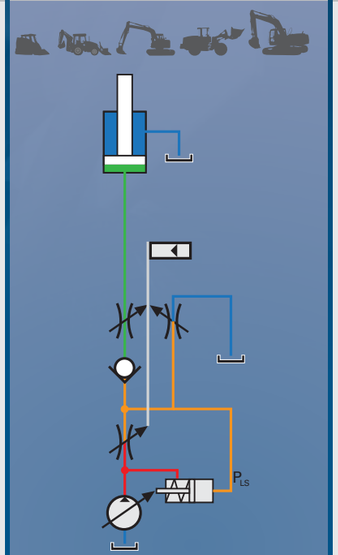
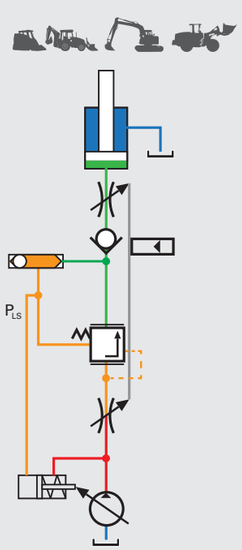
Flow Summation
Making Machines Smarter

A Comparison of Flow Summation™ Valve Technology with Current Market Systems.

Hydraulic System	Positive Flow Control	Flow Summation	Pressure Comp. Load Sense
			
PUMP	Variable EH Displacement	**Variable Load Sense**	**Variable Load Sense**
PUMP FLOW	**Sum of Operator Commands**	**Sum of Operator Commands**	Flow at Highest Load Pressure **Sum of Operator Commands**
METHOD	Hydraulic Pilot Computer or Pressure Sensors, Controllers and Solenoid	**Hydraulic Flow Summation on Main Spool**	LS Shuttle Selects Highest Pressure
BYPASS	**Progressive Open Center**	**Progressive Open Center**	Closed Center
COMPENSATION	**Engineered on Spool and Priority Circuit**	**Engineered on Spool and Priority Circuit**	Reactive Compensator Creates Pressure Drop Based on Load Difference
ACTUATION	Pilot Operated	**Pilot Operated, Electro-Hydraulic, Manual**	**Pilot Operated, Electro-Hydraulic, Manual**

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FS-Series

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FS-Series

Hydraulic Control Valves

Flow Summation™ control valves are the biggest advance in hydraulic valves for construction equipment in the last 20 years. They combine variable pump efficiency, open center valve simplicity with controllability & efficiency rivaling more complicated and expensive 20T excavator systems. The Flow Summation control valves platform is delivering these breakthroughs to backhoes, excavators, skidsteers, Telehandlers, wheel loaders and other applications.

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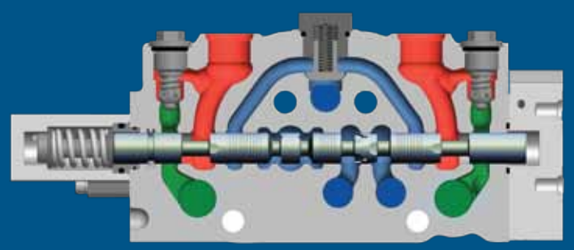
FLOW SUMMATION CONTROL VALVES USE LOW COST COMMODITY LS VARIABLE PUMPS, SAVING MONEY IMPROVING EFFICIENCY

PROVIDES 20T EXCAVATOR OPERATOR CONTROLLABILITY FOR A FRACTION OF THE COMPLEXITY AND COST

FLOW SUMMATION CONTROL VALVES DO NOT USE COMPLICATED ISOLATORS OR COMPENSATORS, ONLY HIGHLY ENGINEERED SPOOLS FOR CONTROL

The technologies employed in the Flow Summation valve is poised to be become the new market standard for controlling hydraulic work functions on construction equipment. After first deploying a prototype of the Flow Summation valve in 2010, the technology has moved rapidly to a production reality. FS-series products employing Flow Summation valves are standard on a number of excavators for a major world-class OEM, creating efficiency and controllability differentiation that have positively proven the technology in the market and in the field. Flow Summation control valve technology continues to be awarded production commitments on a variety of machine types and with multiple customers, representing tens of thousands of systems per year since 2011.

The cornerstone of the Flow Summation valve is its ability to provide "excavator" efficiency & controllability using low cost commodity LS pumps instead of the expensive pilot computers & positive feedback pumps or inefficient negative feedback pumps which are common on excavator systems. Using low cost LS commodity variable pumps leverages these pumps' existing market dominance in the utility construction market and maintains Flow Summation control valve compatibility with steering and other LS functions. Coupled with the LS pump, our control valves employs excavator metering strategies resulting in smooth, predictable response and efficient, variable pump control. A Flow Summation control valve is also a significantly simpler and more refined solution since there are no isolators or compensators — it uses only spools for control.



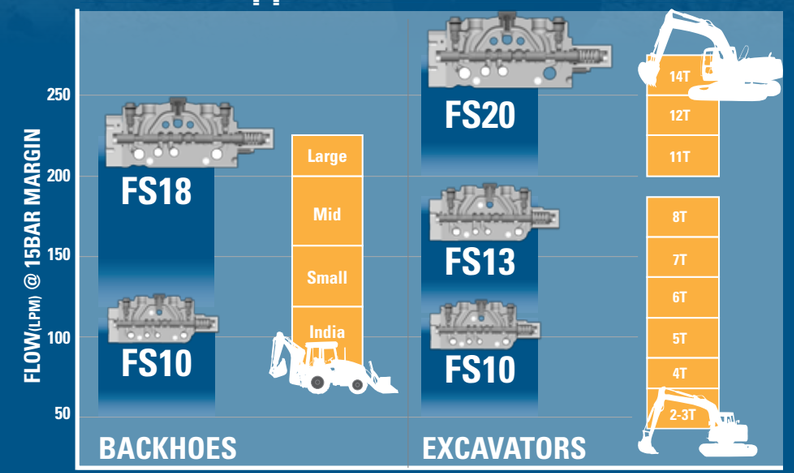
Through HUSCO's engineering capabilities, Flow Summation can be further enhanced through the optimization processes we have developed over the past 6 years—the same processes that brought about the advanced technologies like Flow Summation valves and INCOVA to market. By fingerprinting your machine's performance characteristics, HUSCO can engineer the valve to your application, creating an individualized solution that brings the best out of your machine in efficiency, controllability and overall performance.

The largest advance in hydraulic valves for construction equipment in the last 20 years, Flow Summation™ control valves bring together variable pump efficiency, open center valve simplicity with controllability & efficiency comparable to more complex and expensive 20T excavator systems, making this performance available to backhoes, excavators, Telehandlers, wheel loaders, skidsteers and a host of other machine applications.

Flow Summation control valves provide many advantages to the mobile construction equipment market. The efficiency benefits have been proven on three machine platforms with results ranging from 10% to 20% improvements in fuel efficiency. The technology also simultaneously provides smoother, more stable control than PCLS systems by using high-end excavator control strategies. These results were not achieved with a more complicated system, but rather a more refined, simple solution, as well as compatibility with Load Sense variable pumps, making for easy installation into existing systems.

FS-series valve performance has been validated by HUSCO and multiple machine manufacturers worldwide through extensive machine testing performed by OEM engineers and expert operators. With the engineered compensation schemes, Flow Summation valve equipped machines operate at a much lower average power, and deliver efficiency improvements as high as 20%. In addition, the expert operator feedback on the improved controllability has been extraordinary. Without exception, the operators have found FS-series valves to be smoother and more controllable than traditional PCLS systems.

Common Applications



Isn't it time you see what Flow Summation valves can do for your machine?

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