By-wire Electrohydraulic Control Systems and Applications in Construction Equipment Industry

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Embedded digital control has changed the way hydraulic motion control systems are designed. Digitally controlled closed center valves and variable displacement pumps have been quickly replacing the older generation pilot actuated, mechanically controlled, open center valves and fixed displacement pumps in hydraulic systems in applications such as earth moving equipment (i.e. wheel loaders, excavators, harvesters). Based on new system concepts and coordinated real time motion control, the power efficiency of the hydraulics using closed center systems can be improved compared to the open center systems to the point that significant fuel savings can be achieved. Furthermore, the machine behavior can be optimized for different applications making it behave like a different machine via real-time control software capabilities. Nonlinear, adaptive and learning control algorithms are developed for the next generation of earth moving equipment applications. Energy efficiency, high performance, software based re-configurability and reliability are the main objectives in design.