

#### **Subject: HIC (Hydraulic Integrated Circuit) Manifolds – the good, the bad, and the ugly.**

Many original equipment manufacturers (OEM's) of mobile equipment have become familiar with the benefits of Hydraulic Integrated Cartridge valve manifolds also known as HIC valves. Experience in a variety of markets and applications has made Kraft Fluid Systems experts in designing, manufacturing, and inventorying these custom solutions for OEM clients.

**The Good** - The benefits of HIC valves are clear; adding increased functionality into a single component compared to a “breadboard” approach with the complexity of plumbing many individual valve bodies together. HIC manifolds eliminate the hose and fittings needed to connect multiple valves which reduces installation time, eliminates potential leak points, saves space, reduces weight, and potentially reduces cost.

**The Bad** - The cost structure of HIC valves is influenced by volume. As they are typically a custom component, the machined manifolds typically cost more in small quantities. If the intended client's machine is produced in low volumes (under 5-10 machines annually), the HIC valve solution can be costly compared with plumbing individual valves. Conversely, if the same client's machine is produced in higher volumes (greater than 10 machines annually) the HIC valve may provide a significant cost savings. Kraft does have other product offerings to address this challenge including the wide ranging and flexible family of Danfoss PVG proportional sectional valves. These valves are built from standard sections which can be stacked to accommodate multiple work functions. Each section can be specified with specific functionality, pressure settings, and flow settings. Using our build center inventory, this may be faster and less costly approach depending on the needs of the application. Additionally, as machines evolve; custom HIC manifolds have to be redesigned to accommodate additional functionality where sectional products may be able to be quickly and easily reconfigured.

**The Bad (2)** - Occasionally an OEM client will be in a time-sensitive situation where a prototype machine is of the utmost importance. In these cases, often the prototype is pre-sold or there isn't enough time to build a prototype. Complicating the time crunch further, a prototype HIC may have a long lead time and there may not be enough time to fully test and evaluate it. Bypassing the prototype process always creates risk. Prototyping may catch an error in the hydraulic circuit, a forgotten option, or an incorrect understanding of machine functionality. Although it is tempting to bypass prototyping or place the prototype and production order at the same time, either could lead to running many incorrect manifolds instead of just one. Even worse, a missed detail could be found after many machines have been commissioned in the field. Speed to market is critical; however recall the old adage “haste makes waste.” One of my colleagues has often joked, “I guarantee two things; that the prototype will work, and that the second machine will be different.” As system integrators and machine manufacturers cooperate, Kraft knows there are always evaluations needed to build new concepts, adjust direction, and incorporate different features. Always prototype!

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**The Ugly** - Unfortunately in the field we have seen less-experienced salespeople from other companies applying HIC valves that are not practical. The thing that keeps me awake at night is when a distributor salesperson recommends consolidating several functions into one manifold without regard for where the actuators are located. Putting a large single manifold near the pumps, in one area of the machine, and running dozens of work function hoses to all corners of the machine is usually not best practice. It may look good or simple on the schematic but adds to the cost of plumbing materials and labor, while consuming throughput time on the client's assembly line. I call this "the ugly" because running large bundles of hoses in all directions around a piece of mobile machinery can in fact, just look ugly!

The better approach to significantly reduce plumbing, is to install smaller valve manifolds for each area of the machine, which are appropriate for the actuators in that proximity. As a result, the only hoses that have to run the length of the chassis are the pressure, tank, and load-sense. Running three hoses to the opposite end of a machine to feed an additional valve bank for 5-10 additional actuators, saves the cost of running 10-20 more hoses to each actuator individually from a central valve location.

The decision to use HIC valves and how much consolidation is done in manifolds compared to overall machine design, should be considered carefully. As system integrators, Kraft thoroughly evaluates the needs of our OEM clients to make sure we are not only meeting the needs of the hydraulic schematic "on paper", but also the practical implementation of a system that adds value by reducing cost, labor, plumbing, and space.

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