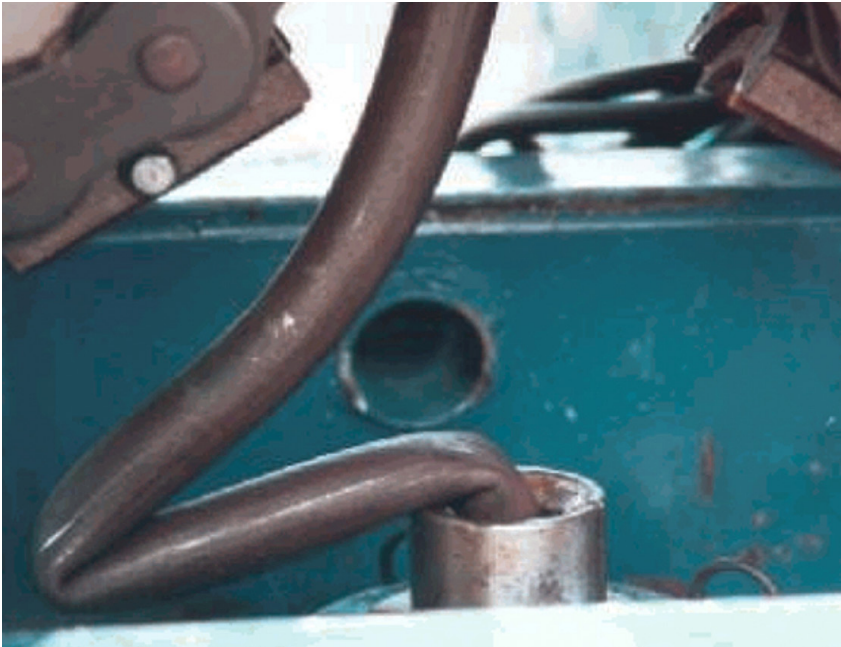


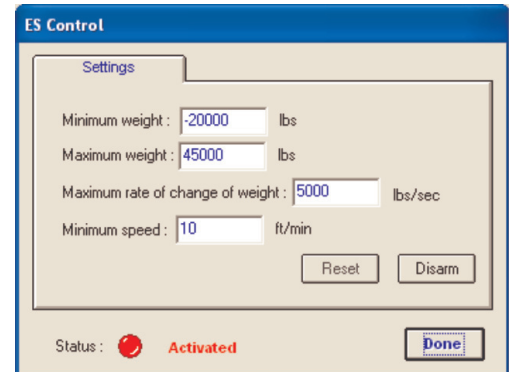
Emergency Stop System (ESS)

Safety device helps avoid costly operational failures



The Emergency Stop System uses a combination of electro-hydraulic control valves and pressure switches, in conjunction with an Orion™ Data Acquisition System (DAS), to stop the coiled tubing injector in the event of imminent failure.

System operation is accomplished by using the primary PC attached to the Orion DAS or the optional ROVer™ touch-screen interface. The ESS is adaptable to most coiled tubing units and can be installed during the manufacturing process or retrofitted in the field.



Features and benefits

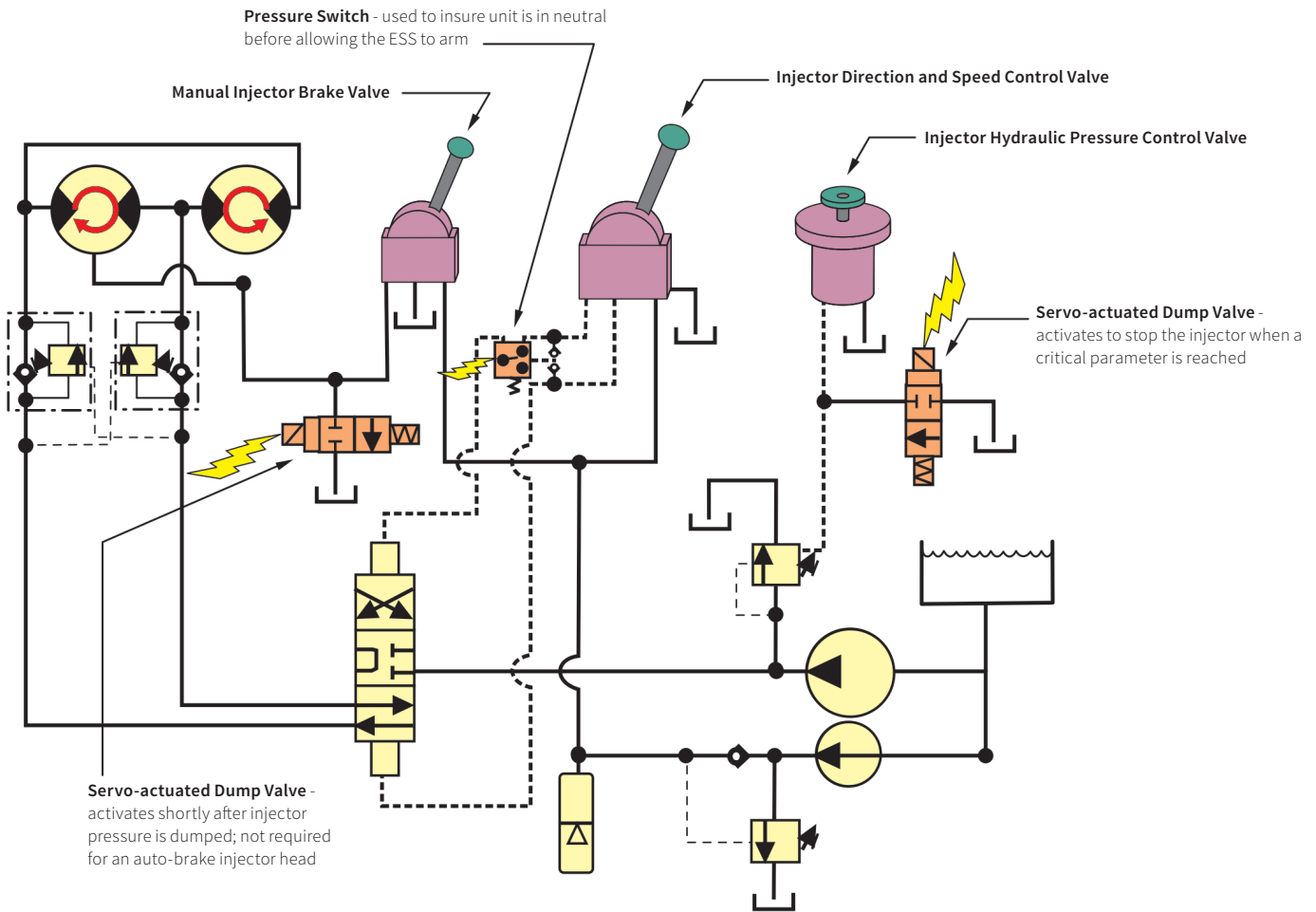
- Helps avoid costly operational failures
- Operator configurable
- System status displayed on-screen
- Records all events in Orion DAS Event Log
- Integrates into Orion DAS
- Retrofits to most coiled tubing units
- Continuous real-time monitoring of:
 - Minimum and maximum weight
 - Maximum rate of change of weight per second
 - Minimum coiled tubing speed

Safety controls

- “Armed” = ready to protect
 - Operator parameter-input required
 - Indicated by green light and log entry
- “Activated” = shutdown in effect
 - Requires no action by the operator
 - Indicated by red light and log entry
 - Sets injector brake
 - Can be rearmed after activation
- Safety
 - Injector controls must be in neutral position before system can be armed
 - ESS can be by-passed by the operator

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Sample System Schematic
(Not representative of all designs)

The operator responsible for the coiled tubing unit is a critical component of field operations, with key responsibility for controlling the coiled tubing injector. Serious events such as surface buckling or tensile yielding of the tubing string can occur when the operator is distracted, fatigued or working under a stressful environment. Even under optimum conditions, the average operator’s reaction time to avoid such events can still be too long.

The ESS, an optional upgrade to the Orion DAS, provides a layer of defense to assist in preventing a simple distraction from becoming a very costly learning experience. Every action, from start-up to shutdown, is recorded in the Orion DAS Event Log.

Specifications

Delay from fault detection to injector shut down	Maximum 1.0 second
Delay from injector to or brake	3.0 seconds
Tubing speed	Maximum 150 ft/min
All other Orion data acquisition system specifications apply	

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