Innovative STOPPLE® Train Plugging System Achieves Double Block And Bleed

By Frank Dum, T.D. Williamson, Inc., Tulsa, OK

Whether it’s routine maintenance or an emergency repair, work done on a pressurized piping system requires both excellent equipment and proper procedure. The work might take place on a remote section of transmission pipeline far removed from the nearest city, deep below the surface of an ocean, or in the middle of a busy chemical processing plant, but wherever it is, modifications to any active line must be done with the utmost care, and with all appropriate safety measures in place.

Because they typically require high concentrations of personnel and large infrastructure investments in a highly volatile environment, hydrocarbon processing facilities such as refineries are increasingly seeking out a double block and bleed option when isolating a section of an active line for repairs or additions without interruption of service.

That is, operators are looking for ways to install two barrier surfaces (plus a bleed port for pressure monitoring) between a line’s pressurized contents and any downstream work being performed, such as pipe cutting or welding. In response to this rising demand for a double block and bleed capability, the engineers at T.D. Williamson, Inc. (TDW) have developed the STOPPLE® Train plugging system.

Proven Technology

Though it represents an innovative new method to achieve double block and bleed, the patent-pending STOPPLE® Train plugging system is based on proven technology developed by TDW in the 1950s as a means to temporarily block sections of active piping systems.

“The STOPPLE Train system uses components that have been proven throughout the world in thousands of plugging jobs over many decades,” says Greg Puckett, senior project engineer for TDW. “The engineering analysis of the STOPPLE Train pluggers is based on the same proven principles.”

What makes the STOPPLE Train plugging system unique is that it links two plugging heads into a “train” capable of providing a double block and bleed function. In the past, pipeline operators have used a number of different methods to achieve double block and bleed. For example, two separate valves with a bleed port between them can achieve this. Or, the combination of a valve and a plugging head with a port between them can work, as can the tandem of a plugging head and an isolation plug with a port between them.

Many operators have simply used two plugging heads and a bleed port. What all of these methods have in common is the dual-barrier concept. Whether the barriers are valves, plugging head seals or combinations thereof, the basic premise is that a second barrier serves as a failsafe for the first.

But whereas these other methods typically require more than one hot tap and fitting to achieve double block and bleed, the STOPPLE Train plugging system requires only one. Its linked plugging heads can be inserted into a line through just one opening. A single hot tap and fitting thus yields the double block benefit of two inline plugs. A pressure bleed port positioned between the two plugging heads allows the void between the heads to be bled down, creating a zone of zero energy. This port also allows for seal verification and monitoring. If the operator so chooses, this system can also be used without the bleed port to get the safety advantage of redundant seals.

Maximum Safety

If the refinery trend toward double block and bleed requirements is driven by safety concerns, then any design purporting to offer double block functionality must, first and foremost, be safe and reliable. Designing in a hearty failsafe margin was a priority during development of the STOPPLE Train plugging system.

“The added safety of the STOPPLE Train system comes from its two seals,” explains Rick Goswick, TDW designer. “With a tap
between the two seals, that area can be monitored for leakage before and during work on the pipeline downstream. In the unlikely event that the first seal leaks, the second seal is fully capable of holding the line pressure by itself.

The STOPPLE Train system is also robust enough to handle both low-pressure and high-pressure environments. Tests have shown that at low pressures, compression between the sealing elements and the pipe ID creates an excellent barrier. In fact, the sealing element does not even need to be energized to seal. At 0.5 psi to 5 psi, the compression fit alone is sufficient. Once energized, the seal will remain intact until broken by an external force, such as retraction of the plugging head.

On the other end of the pressure spectrum, both plugging heads in a STOPPLE Train system are rated to 1,000 psi at 180°F, or to 600 psi at 350°F. They have been tested successfully at 1.5 times this rating, and the pressurized plugging heads have been successfully tested together and independently.

Because the STOPPLE Train plugging system requires only one hot tap and a standard fitting, fewer potential leak paths are left on the piping once work is complete. Compared to other methods for achieving double block and bleed, which typically require twice as many line penetrations, this represents a major improvement. Fewer fittings also results in less expense.

**Substantial Savings**

“The STOPPLE Train plugging system offers substantial cost savings over other double block and bleed methods by reducing the amount of fittings placed on the line,” notes TDW engineer Allen Richardson. “Further savings result from less excavation, fewer pieces of equipment, less welding and a shorter overall job time.”

Shorter jobs result in less exposure to potential hazards for personnel. There is also a reduced need for site support (scaffolding, cranes, etc.) and fewer permits and inspections required. Plus, fewer fittings conserves space in the pipe rack, which is particularly helpful in refineries, where space is often at a premium and space limitations are often a concern. Because the STOPPLE Train plugging system functions well in all horizontal and vertical orientations, it can be used in a wide variety of pipe rack configurations.

Perhaps the most cost-effective aspect of this new plugging system stems from the fact that it is based on proven technology. Pressure ratings for the STOPPLE Train system follow traditional STOPPLE parameters, and all standard STOPPLE tools apply to the maintenance of the STOPPLE Train heads. Overall, use of the Train plugging system requires nearly identical training, operation and maintenance as for all STOPPLE systems, meaning many experienced users will see very little change (other than a little extra plugging head travel length) from their typical plugging operations.

To introduce the STOPPLE Train plugging system to market, TDW is releasing a focused initial wave of five plugging head sizes specifically selected to cover about 80% of hydrocarbon processing industry applications. These are 4-, 6-, 8-, 10- and 12 inches, all designed for use with Schedule 40 pipe. As stated previously, all of these STOPPLE Train plugging heads are rated to 1,000 psi at 180°F, or to 600 psi at 350°F. Following the introduction of this first wave, a second series of sizes tailored to cover about 80% of pipeline market needs is planned for later in 2009.

**Author:** Frank Dum is manager of transmission and refining solutions for T.D. Williamson, Inc.