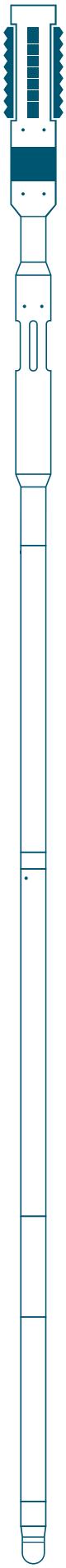
TENDEKA

PulseEight Electronic Ambient Valve



The PulseEight Electronic Ambient Valve (EAV) is used in situations where storm chokes or ambient valves offer the only choice for continuing to safely produce wells with failed safety valves. The PulseEight EAV offers the capability to continue production whilst being able to respond to incidents associated with losses of surface containment or emergency shutdowns.

The PulseEight EAV uses a pressure monitoring system and electric motor to autonomously actuate the valve based on safety critical events or a predetermined surface pressure routine.

The EAV is designed to ignore not only declining reservoir pressure trends which can plague conventional ambient valves, but also the highs and lows associated with normal hydrocarbon production. The EAV is constantly monitoring the flowing pressure regime of the well and is awaiting a time-based change in these pressures that are characteristic of a loss of surface containment. These rapid pressure drops trigger the valve to close, isolating flow from below. Similarly, pressure events associated with emergency shutdowns will also result in valve closure.

Re-opening the valve couldn't be simpler; a staged application, or removal, of pressure above the tool will cause the EAV to reopen. The number, amplitude and duration of each stage is individually configurable and is designed to create sufficient complexity to prevent accidental address but also sufficient simplicity to allow production to be restarted quickly. The ability to reopen with up to 1,500psi differential across the valve, application of high surface pressures to balance across the tool is not required.

The EAV is deployed in the well via conventional intervention methodologies and is mounted to a lock mandrel, packer or retrievable bridge plug, via a simple threaded crossover. Installation can therefore easily take place at, or around, existing safety valve depth or elsewhere in the well as required for adequate control.

This compact self-contained and self-powered downhole tool does not require any mechanical interface with other surface systems. The EAV is designed to send a signal to surface at 24-hour intervals to confirm functionality of the system and provides a clear indication with minimal analysis required. Monitoring of the surface pressure for this Vitality Pulse provides the operator with a daily confirmation of the EAV's functional capability, something not available with any safety valve or storm choke. Additionally, the vitality pulse can provide details on remaining battery life providing clear indications, in advance, of impending power depletion such that an intervention can be scheduled to keep the well producing for as long as possible.

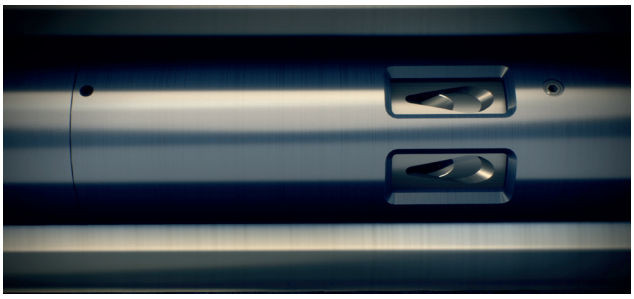
Features

- Can be deployed in slickline
- Compatible with most lock mandrels and plugs
- Can respond to both loss of surface containment or emergency shut-down events
- No surface connection required for control

Benefits

- Less sensitive to changes in flowing pressures
- Easily programmable parameters
- Well does not need to be balanced to re-open
- Allows testing of tree valves to higher pressures

Where a battery change-out has not been able to be conducted, the tool will function closed when the battery depletion exceeds a minimum energy threshold, thus leaving the well in a safe condition until an intervention can be scheduled. This forms one part of a multiple fail close capability with the failure of other components such as the quartz pressure sensors causing the tool to close along too. Each closure is coupled with a unique signal to surface that will indicate the reason.



Technical Specification

EAV name	3½”	7”
OD	2.50”	5.00”
EAV length (3 batteries)	29.40ft	29.17ft
Max rate	10,000bbls/day	30,000bbls/day
Body pressure	10,000psi	
Static seal rating	5,000psi liquid / 3,000psi gas	
Unloading rating	1,500psi	
Service temp	110°C/230°F *Qualified limit, can review on application basis	

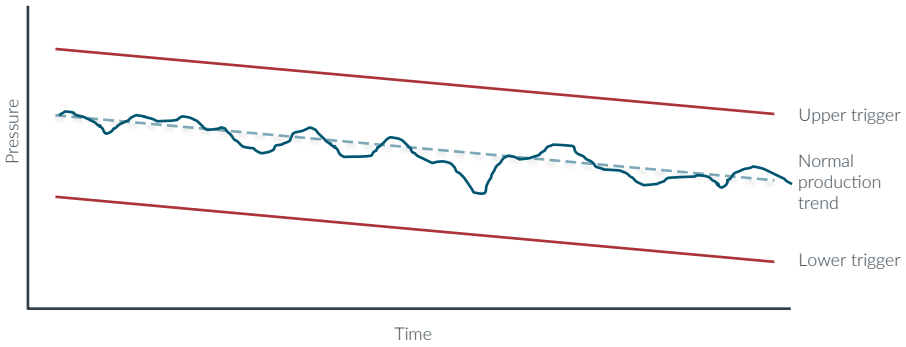


Figure 1. As EAV monitors for short-term changes in flowing pressure, normal pressure decline is ignored

PulseEight EAV is constantly monitoring flowing pressures and is engineered to ignore long-term production trends or sporadic peaks and troughs of normal production. This results in the trigger values always trending with the current flowing conditions. This prevents inadvertent actioning of the valve through everyday use, but ensures it will function closed when required. *(See figure 1)*

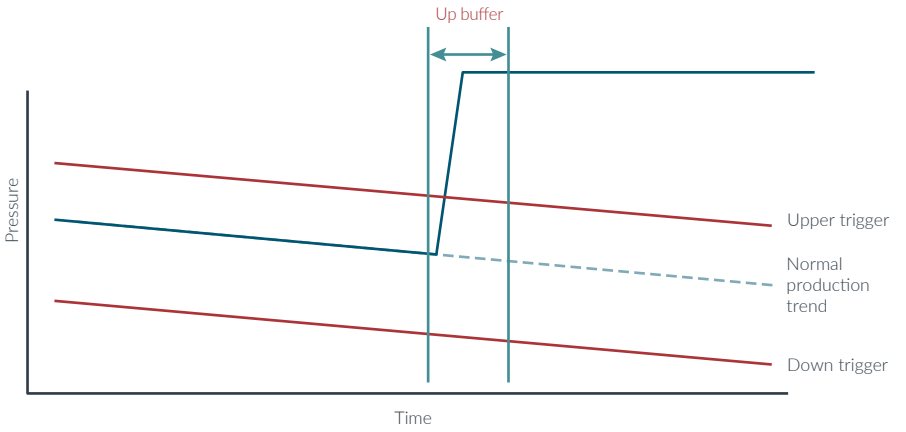


Figure 2. Rapid pressure increases within the upper time buffer (such as ESD events) will cause the tool to close

The time-based pressure changes, both up and down, allow the tool to recognise characteristics of loss of containment and emergency shutdown events. If the trigger threshold is exceeded in a rapid time frame, regardless of whether the entire buffer period has elapsed, the tool will start closing ensuring the flow is controlled in a suitable time frame. *(See figures 2 and 3)*

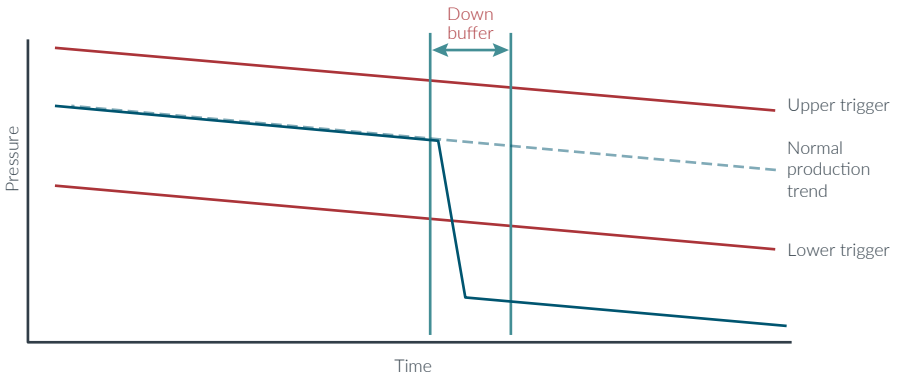


Figure 3. Rapid pressure decreases within the lower time buffer (such as loss of surface containment events) will cause the tool to close