

The Ultimate Hole Cleaning System While Drilling AVOS - Annular Velocity Optimisation System

SplitFlow Hydraulics

- Maximise Annular Velocity and Increase Hole Cleaning efficiency
- Divert excess flow into the Annulus above the BHA using the AVS tool
- Engineer AVS and BHA hydraulics using IDT's SplitFlow software

AVS and AVT Electronic Multi Position Circulating Valves

- Downlink from surface to command
- Throughbore
- Splitflow position with Variable Dispersion Nozzle system
- Full Bypass position with 4in² TFA
- Fullbore closure if pumping LCM
- No balls, darts or surface intervention
- TANDEM downlink command protocol to control AVS and AVT when run together for rapid wellbore clean up

AVD Electronic Intelligent BHA Disconnect

- An AVS tool with an integrated BHA disconnect module
- Operator can decide to disconnect from BHA in a stuck pipe situation
- AVD uses its onboard sensors to establish it is stuck
- Process Logic safeguards have to be met before the AVD is ready to disconnect
- Final command given from surface

Get off that stuck BHA fast and reliably

AVS, AVD and AVT Electronic Programmable Drillstring Circulating Valves

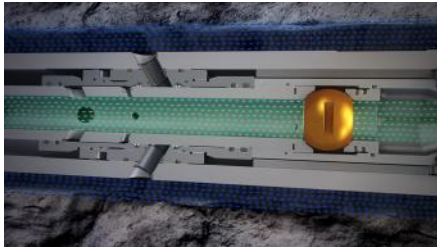
Common Features:

1. Throughbore
2. Electronic, battery powered
3. Command by surface Downlink
4. Full bore closure in bypass position
5. Rapid activation
6. Splitflow and full Bypass positions
7. 4 x Upward facing Diffuser nozzles

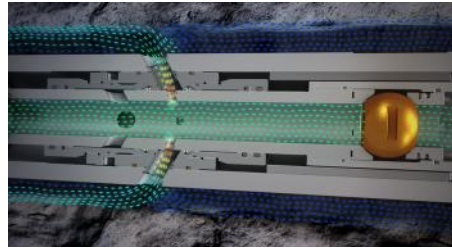
Common Benefits:

1. Can be placed anywhere in the BHA or drillstring
2. Low power draw- in excess of 200 activations
3. No Balls or Darts
4. Works in any inclination
5. Run multiple tools in the drillstring
6. Customise nozzle size for your well/BHA
7. Multiple applications

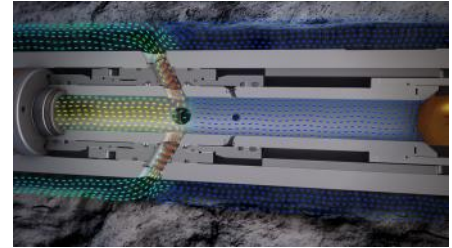
INTELLIGENT DRILLING TOOLS



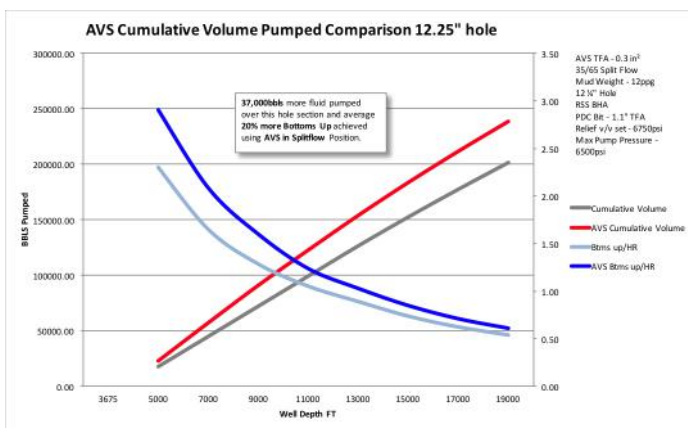
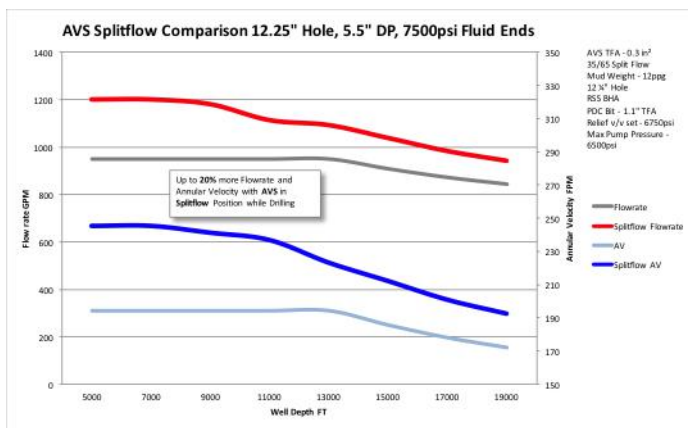
AVS in Throughbore position. This is the standard position where all the drilling fluid is pumped through the AVS, BHA and drillbit.



AVS in Splitflow position. A portion of drilling fluid bypasses the BHA, reducing pressure losses, allowing a flow increase, maximising AV.



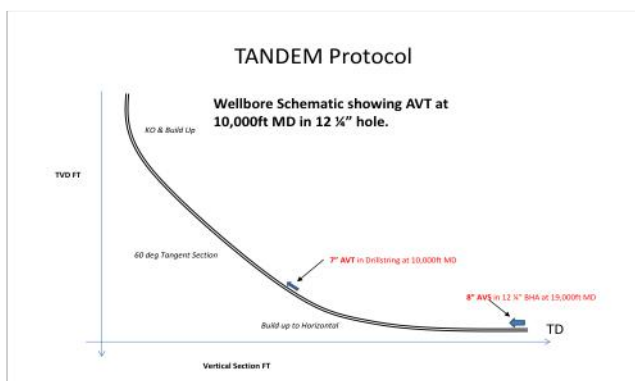
AVS in Bypass position. 4in² TFA are opened for rapid wellbore clean up or dumping of LCM. A ball valve closes to protect BHA components.



What is Splitflow?

Hole cleaning effectiveness is a function of; Hole angle, Mud rheology, Hole size, Drillpipe size, drillstring RPM, Mud density, Mud annular velocity, Annular eccentricity, Cuttings size and ROP. Practical experimentation has shown that the most effective hole cleaning parameters are Mud Annular Velocity and Mud Density. The higher the AV, the more cuttings are removed from the wellbore. The AVS and AVD can be Nozzled to allow a certain amount of the flow to be diverted into the Annulus, bypassing the BHA. This can be engineered using IDT's SplitFlow software to allow the minimum flow requirement to power MWD / RSS / Motor / Bit hydraulics etc., and the remainder out to the annulus. This maximizes Annular Velocity for a given surface pressure.

The 1st chart opposite shows how a Splitflow of 35/65, keeps enough flow going through the BHA (800-600gpm) to power BHA and bit components but the overall flowrate is 20% higher than if all the flow was going through the BHA. The 2nd chart shows the increase in cumulative volume pumped over the example hole section. This is over 37,000bbls additional fluid pumped which means 20% more cuttings removed from the wellbore.



Tandem Protocol

The AVT is a single position circulating valve with Bypass only and no full closure. The AVT is run in the drillstring at a strategic point as depicted in the diagram opposite. An AVS is run in the BHA. A single Downlink called Tandem is sent. The AVS goes to bypass and the clean up commences, when the cuttings pile is above the AVT, the AVT opens to Bypass and the cuttings are rapidly circulated up the annulus from that point.