

The DAPC Choke Manifold

Achieve new levels of pressure stability with the unmatched control of At Balance's Automated Pressure Drilling™ (APD™) services. The APD service for constant bottomhole pressure control utilizes the Dynamic Annular Pressure Control™ (DAPC™) system - a suite of pressure management tools that give operators the capability to save time and money spent controlling lost circulation, influx, and stuck pipe. The DAPC system delivers increased stability and control for new levels of drilling performance in hostile environments while improving safety, reducing risk and lowering cost.

The Dynamic Annular Pressure Control™ (DAPC™) system incorporates a fully automated choke manifold to precisely manage backpressure during connections and while drilling with pipe, coiled tubing, or liner.

The Choke Manifold

The DAPC choke manifold provides automated, controlled pressure stability for constant bottomhole pressure. The system continuously monitors and analyzes changing pressure conditions in a well and uses the choke manifold to actively stabilize pressure at a speed manual and semi-automated systems cannot achieve. The ability to make immediate adjustments saves rig time and cost by significantly increasing response to potentially critical well control events.

Pressure and drilling data are communicated over a high speed link to the pressure manager and hydraulics model. The pressure manager measures and manages the backpressure at the level calculated by the hydraulics model and instantly adjusts the choke manifold as conditions change.

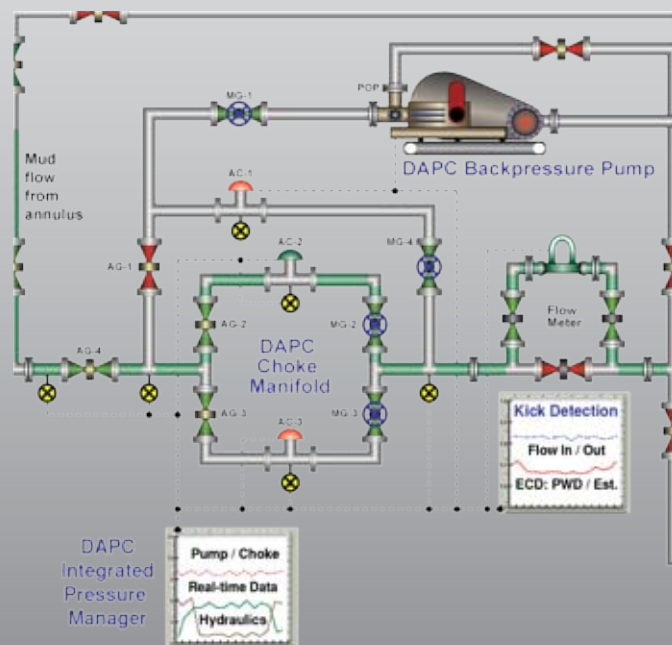
The pressure manager is programmed to respond to different contingencies by utilizing the manifold's ability to switch between redundant main chokes (see illustration) and its auxiliary choke connected to the on-demand, backpressure pump.

If the active main choke opens or closes beyond the programmed position the pressure manager will automatically switch to the second choke and isolate the first to stabilize the bottomhole pressure. If flow rate drops below the programmed level the pressure manager will automatically turn on the backpressure pump and switch to the auxiliary choke to maintain constant bottomhole pressure. If communication between the pressure manager and the manifold is disrupted then the system stabilizes pressure by stabilizing the choke position and switching to manual mode.

The DAPC choke manifold delivers around-the-clock backpressure control by ensuring continuous mud flow. It achieves this with large ID piping, redundant choke legs, and automated switching in the event of a jam.

Plugging is minimized through the use of 4-1/16" chokes which have the largest internal orifice (3.0"). Also, if debris plugs the active choke, the pressure manager will automatically increase its opening to relieve the pressure and clear the debris. If the choke reaches the full-open position and pressure is still unrelieved then the pressure manager will automatically switch to the backup choke and alerts the operator to manually open and unplug the choke.

In addition, the pressure manager is capable of operating the backup main choke as either the primary pressure relief valve (PRV) or a backup PRV, all while continuously controlling backpressure through the active main choke. Its ability to smoothly control pressure eliminates sudden and potentially damaging pressure spikes that can be caused by normal PRV operation.



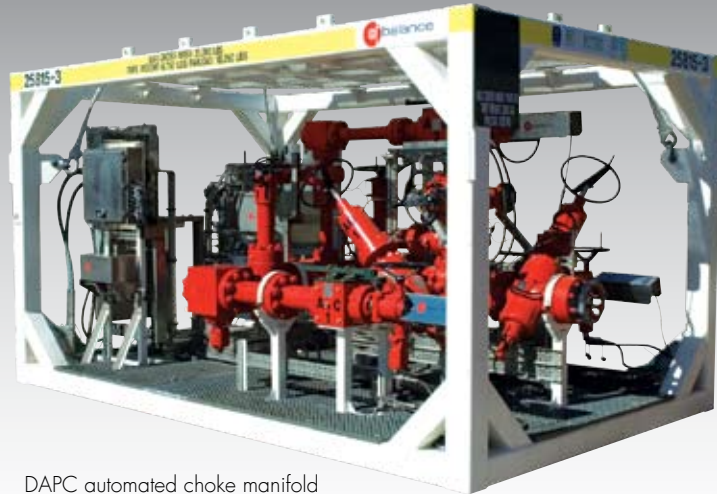
P&ID illustration: Piping and instrumentation drawing (P&ID) of the DAPC manifold in drilling mode.

Active main choke: AC-2; Redundant main choke: AC-3

Auxiliary choke: AC-1

In drilling mode mud flows from the annulus to the manifold and through choke AC-2 for pressure control. AC-3 is closed for backup. The backpressure pump and auxiliary choke, AC-1, are on standby to supply and control backpressure when the flow rate drops below programmed levels.

AUTOMATED BOTTOMHOLE PRESSURE CONTROL



DAPC automated choke manifold
DNV 2.7-1/T3, Class 1/Div 2/Zone 2, ATEX-certified, built in a DNV-certified crash frame

The Dynamic Annular Pressure Control™ system is able to measure, manage, and control bottomhole pressure at a speed manual methods cannot achieve.

The automated pressure control manifold provides pressure stability and increased responsiveness needed to reduce the rig time and expense spent on lost circulation, influx, and stuck pipe.

The DAPC system actively manages and precisely controls bottomhole pressure. It extends drilling in mature fields while mitigating the risks of potentially critical well events and improving safety.

Choke Manifold Technical Data and Specifications

Main Choke Type

EEC HXE 4-1/16" 5,000 psi (345 bar) WP 3" Max. Orifice

Auxiliary Choke Type

EEC HXE 2-1/16" 5,000 psi (345 bar) WP 2" Max. Orifice

Choke Specifications

- Automated/Manual Control
- Gear Operated
- Type HDI Digital Position Indicator
- ATEX Directive 94/9/EC Compliant
- Intrinsically Safe Class 1/Div 2/Zone 2/
ATEX Group II Cat 3G
- DNV-Certified Lifting
- API 6A PSL-2, Mat Class DD,
Temp Class P+U [-20 to 250°F (-29 to 121°C)]
- H₂S Service per NACE MR-01-75
- Working Pressure: 5,000 psi (345 bar) WP
- Test Pressure: 10,000 psi (690 bar)
- Full-Rated WP Maintained at 250°F

Hydraulic/Manual Gate Valves

- Anson E-Type through Conduit
- Double-acting w/Manual Close Override
- API 6A, PSL-2, Temperature U, Material DD
- Forged AISI 4130 Steel Body
- Metal-to-Metal Sealing – Body-to-Seat, Seat-to-Gate, Bonnet-to-Body
- Non-Rising Stem w/Back Seat
- Shear Pin Protect Internals
- Quick Release Hand-wheel
- Valves Complete w/Balanced Stem w/Limit Switches

Manifold Technical Data

- Manifold Dimensions: 15.4' x 8.9' x 8.2' LWH
(4.8m x 2.7m x 2.5m)
- Manifold Weight: 26,235 lbs (11,900 kg)
- Operating Temperature: -20 to 250°F (-29 to 121°C), API P-U
- Multiple Pressure Monitors:
 - 4 to 20mA signal
 - 0 to 5,000 psi (0 to 345 bar) range
- Remote-Operated Automated Control
- Remote-Operated Manual Control
- Skid-Mounted Manual Operation
- Redundant 4-1/16" Main Chokes
- Auxiliary 2-1/16" Backpressure Choke
- Flow Rating: 1,000 gpm (3,785 lpm)
- Pressure Rating: 5,000 psi (345 bar)
- API 6A, DNV, ATEX-Certified
- Class 1/Div 2/Zone 2
- Spec'd for H₂S Sour Gas Service
- DNV-Certified Crash Frame
- Hydraulically-Operated Valves
- Electric Hydraulic Pump – 380 V
- Accumulator Size: Closes 2 Chokes/Valves If Pump Fails
- Automatic Emergency Shutdown
- Optional Redundant Manual Choke/Valve Controls

On-site Maintenance and Spares Provided

- Pressure sensors
- Valve limit switches
- Solenoid valves
- Choke position switches
- Choke seats and gates
- Seal replacements kits



At Balance™
11767 Katy Freeway, Ste. 1030
Houston, TX 77079

www.atbalance.com
281.558.3182