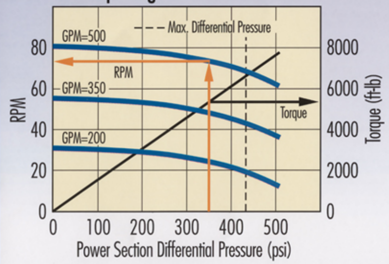
DYNA-DRILL GUIDE TO MAXIMIZE STATOR LIFE

Operating Parameters

- Dyna-Drill publishes a motor RPM and pressure differential recommendation for each model to extend stator life.
- Operating above recommendations deforms stator lobes, produces higher slip, causes elastomer stress.
- Rotor speed is proportional to drilling fluid flow rate and differential pressure.
- As rotor speed increases, Dyna-Drill recommends lower differential pressure.

Interpreting Performance Curves



Power section differential pressure is the difference between "Off-Bottom" and "On-Bottom" pressure. Draw vertical line from corresponding pressure differential value to RPM curve and read motor speed on left axis. Likewise, draw vertical line from pressure differential axis to torque line and read torque output on right axis. (Interpolate RPM for GPM values not shown on chart.) Dotted line shows recommended maximum pressure differential. Operating above recommended pressure can result in frequent stalling of motor and premature stator failure.

The example above shows power section operating at 500 GPM and 350 PSI differential pressure, producing approximately 5200 ft-lb of torque at 73 RPM.

1 Power Section Elastomers

- Dyna-Drill nitrile elastomers give excellent performance, balancing oil and solvent resistance.
- Nitriles are copolymers of butadiene and acrylonitrile.
- Acrylonitrile content of nitrile rubber ranges from 15% to 50%; higher content improves oil and solvent resistance but sacrifices dynamic and processing properties.
- Hydrogenated nitriles (highly saturated nitriles – HSN) offer higher mechanical properties and improved temperature resistance.
- HSN rubber with high acrylonitrile provides high temperature and oil resistance.

2 Rotor and Stator Compression Fit

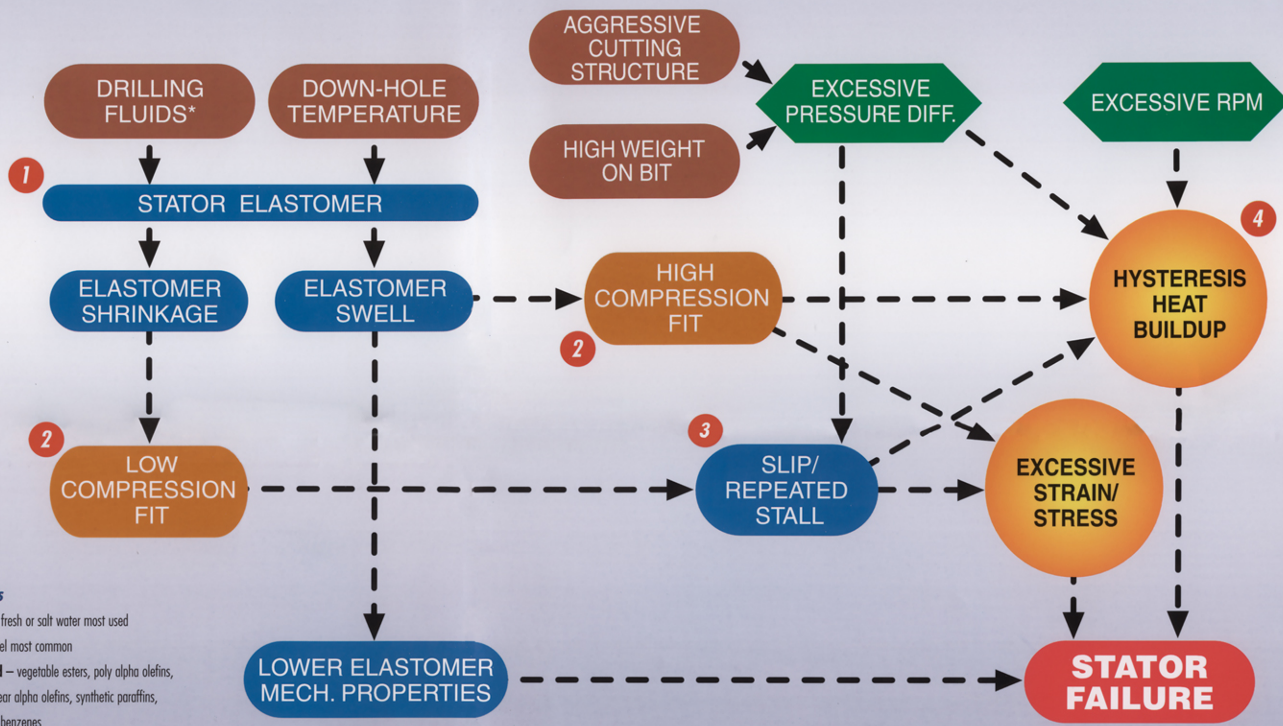
- High compression fit increases rubber stresses and hysteresis heat buildup in the rubber.
- Loose fit produces ineffective seals, reduces torque and invites stalls.
- Power section performance is optimized when compression fit is 0.020" to 0.060" during operation.

3 Effect of Repeated Stalls

- A power section stalls when it cannot keep up with motor torque demand.
- As torque increases, so does pressure differential across the power section.
- Higher pressure differential means more slip and lower rotor speed.
- This action continues until rotor speed drops to zero or stalls.
- In a stall, stator elastomer is strained, allowing drilling fluid to blow by seals.
- High stresses accumulate and repeated stalls reduce stator life.

4 Hysteresis Heat Buildup

- Elastomer's viscous properties generate internal heat, known as hysteresis heat.
- Hysteresis heat accumulates in the thick lobes of stator, accelerating failure.
- Hysteresis heat increases with rotor speed, compression fit and pressure differential.



* Drilling Fluids

Water based – fresh or salt water most used

Oil based – diesel most common

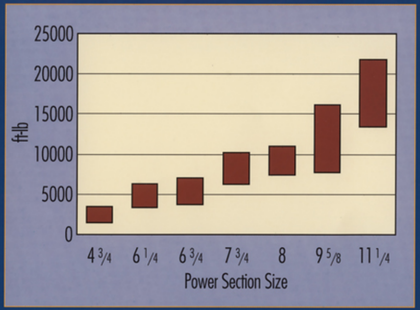
Synthetic based – vegetable esters, poly alpha olefins, internal olefins, linear alpha olefins, synthetic paraffins, ethers, linear alkyl benzenes

Air & foam – used less frequently than fluid

1. Hysteresis heat begins the degradation of the rubber in the middle of the stator lobe.

2. Hysteresis heat buildup results in rubber component volatization and voids are created within the stator lobe.

3. Stator rubber "chunks," due to hysteresis heat buildup.



Range of maximum torque for popular power sections.

Dyna-Drill TECHNOLOGIES

Power that Lasts

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