LOST CIRCULATION STRATEGY
MATERIAL & TREATMENT
**Lost Circulation**

**Causes:**
- Permeable sands
- Cavernous formation
- Natural fractures and fault zones
- Induced fractures

**Poor Hole Cleaning**

**Causes:**
- Low rheology
- High ROP
- Sliding / Low Rotation
- Low flow rate
- Hole instability / washout

**Swelling, Dispersive and Sloughing Shale**

**Causes:**
- Chemical / mechanical instability of shale
- Lack of mud inhibition
- Lack of encapsulation in mud
- Lack of MW

**Hydrogen sulfide (H₂S)**

**Causes:**
- Gas influx from formation
- Thermal degradation of organic mud additives
- Bacterial degradation of organic mud additives

**Differential Sticking**

**Causes:**
- Poor filter cake quality
- Lack of mud/filter cake lubricity
- Depleted sands/Permeable sands
- High ECDs
- Mud losses to formation
- High solids content
### LOST CIRCULATION STRATEGY

#### SEEPAGE LOSSES
- Static 0.2-1.0 m³/h
- Dynamic <10%

#### INITIAL ACTIONS:
- Reduce R.O.P.
- Minimize Flow Rate
- Minimize Mud Weight
- Use LCM in the drilling fluid
- Pump high-vis pills with LCM&CaCO₃

#### PARTIAL LOSSES
- Static 1.0-10.0 m³/h
- Dynamic 10-30%

#### INITIAL ACTIONS:
- Reduce R.O.P.
- Minimize Flow Rate
- Minimize Mud Weight
- Use LCM in the drilling fluid
- Pump water-swellable polymer suspension
- Pump Bentonite paste or Diesel-Bentonite suspension

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**NATIONAL DRILLING SERVICE**
**LOST CIRCULATION STRATEGY**

### SEVERE LOSSES

**Static** >10.0 m³/h  
**Dynamic** 60-95%

- Pump water-swellable polymer suspension
- Pump Bentonite paste or Diesel-Bentonite suspension
- Pump two component composition POLY TGP  
- Combination of cement or gypsum plug
- Pump high-speed hardening polyurethane composition

### TOTAL LOSSES

**Dynamic** 95-100%

- Pump water-swellable polymer suspension with cement or gypsum plug  
- Pump high-speed hardening polyurethane composition
- Pump two component composition POLY TGP with cement or gypsum plug
- RIH patch liner ULKP-1MAH
- Use water as drilling fluid & pump high-vis pills with LCM
- Run casing & cementing

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**NATIONAL DRILLING SERVICE**
LOST CIRCULATING MATERIAL

- Granulated
  - MR - CaCO₃ (fine, medium, coarse)
  - Siderite
  - Barite

- Lamellated
  - KF-R
  - KV (vermiculite)

- Scaly
  - KF
  - Nutshell
  - Rice hulls

- Fibred
  - POLYFIBR
  - Salamander wool
  - Cordage fiber
  - Sawdust

- Polymineral
  - POLYFILTROL
  - Modified Bentonite
  - POLYKSPAN

- Flexible water/oil swellable
  - POLYBLOCK
  - POLYKSPAN
  - POLYPLUG

- Combined
  - KF-C
  - POLYPLUG

- POLYFILTROL
  - Modified Bentonite
  - POLYKSPAN
  - POLYPLUG

- NBS product
LOST CIRCULATING MATERIAL

KF, KF-C
POLYPLUG
POLYFIBR
KF-R
(acid solubility 99%)

POLYFILTROL
NUTSHELL
POLYPLUG-6A
RUBBER

NATIONAL DRILLING SERVICE
High-performance, high-strength additive is a single-sack proprietary blend designed for wellbore strengthening applications and a wide variety of lost circulation scenarios, including, but not limited to, fractures and matrix permeability. This product is applied in the form of a squeeze pill which, depending on the application, de-waters or de-oils rapidly to form a high shear-strength plug. POLYFILTROL additive can be used in water-based or non-aqueous drilling fluids (NAF) for wellbore strengthening applications and to cure losses extending from partial to a wide range of severe lost circulation scenarios, at temperatures up to at least 177° C (350° F).

Typical Physical Properties

- Physical appearance - Gray powder
- Specific gravity - 1.30 – 1.40
- Spread rate (30% conc.) – >25 sm
Product is designed to be used for:

- Wellbore strengthening applications
- Curing partial to wide ranging severe loss situations
- Open hole remedial and/or preventive lost circulation squeeze
- Improving casing shoe integrity
- Cased-hole squeeze for sealing perforations and casing leaks

Advantages:

- Quick-acting plug for wellbore strengthening and lost circulation applications
- Single-sack system, though higher densities may require the addition of a thinner
- High-performance, High-shear strength pill
- Easy to mix and pump with standard rig equipment
- Does not require an activator or retarder
- Does not depend on time or temperature to form a rigid plug
- Can be pre-mixed well in advance of pumping provided pill is agitated continuously
POLYBLOCK - water swellable polymer

POLYBLOCK – lost circulation material is a 100% active, water-swellable, synthetic polymer. POLYBLOCK polymer LCM absorbs hundreds of times its own weight in water.

The use of POLYBLOCK absorbent polymer can assist the following:

• Lost circulation material for horizontal directional drilling
• Prevent inadvertent returns in river crossing applications
• Stabilize borehole in cobble and gravel
• Stabilize unconsolidated formations

Advantages:

• Rapid water absorption
• Effective in mitigating lost circulation
• Economical – small quantity yields large volume
• Easy to use
• Non-fermenting

Typical Properties:

• Appearance - off-white crystals
• Specific gravity - 0.75
• Dry screen analysis - 96% through 5 mesh (4.0 mm)
• Swelling capacity in fresh water - 3.5 ft³/lb (0.22 m³/kg)
POLYBLOCK POLYMERIZATION

POLYBLOCK

POLYBLOCK C
POLYKSPAN Flexible water swellable polymer

Dry POLYKSPAN supplied in 25 kg bags

Liquid POLYKSPAN supplied in 200 kg drums.
POLYKSPAN PROPERTIES

GLYCOL BASED

BRINE BASED
<table>
<thead>
<tr>
<th>№ well, field</th>
<th>Losses interval, m</th>
<th>Losses rate, m³/h</th>
<th>Type of losses</th>
<th>Pill Volume, m³</th>
<th>Quantity pills</th>
<th>Waiting time</th>
<th>Material take-off, kg</th>
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<tr>
<td>#3 Imbinskoe</td>
<td>2400-2404</td>
<td>&gt; 80</td>
<td>Total + Gas kick</td>
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<td>NaCl-120 KF – 80 Polykspan – 200 kg</td>
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<td>#I-18-07</td>
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<td>50</td>
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<td>#321-74</td>
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<td>&gt; 30</td>
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<td>25</td>
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POLY TGP - lost circulation material, specially designed for total losses in terrigenous and carbonate formations, including cavernous-porous formations; composition consists of a blend of polymineral components which mix with water. This technology is based on chemical colmatation while two components of POLY TGP agitate in the losses interval. Thus, as a result of chemical reaction (around 2 minutes), the volume of the composition increases (2-3 times). The final form of the composition represents a porous stone without free water and high plastic strength.
POLYTAN – polyurethane one-component sealant

Major properties:

• When contact with water increases in volume and forms high-elastic mass with closed pore structure;

• Swelling rating depends on water/polymer ratio and may reach up to 5 times;

• When interacting with sand arise artificial stone;

• The resulting material has a high adhesion with hard surfaces;

• Keeps volume, elasticity and durability in wet environments at high temperature differences.
The use of POLYTAN absorbent polymer can assist the following:

- **Total losses**;
- Гидроизоляция водо и рапо проявляющих пластов;
- Ликвидация негерметичностей обсадных колонн;
- Укрепление и связывание слабых грунтов и горных пород;
- При низких температурах окружающей среды (ниже минус 15°C) дополнительно требуется ввод в состав катализатора.