Tricone Rock Roller Bits

First developed for high production open hole drilling in the USA oilfields around 1866 and developed into a 3-cone design in 1931. Tricone drill bits are used for almost any type on non-coring drilling. They come in several different varieties and can deal with a wide range of different rock formations.

Basically, a tricone bit is a 3-cone design, with each cone having a double row of staggered teeth separated by channels to allow the flush to keep the cutting face clean of cuttings and cool the bit.

The teeth on each cone interlock as the cones are forced to rotate around a centre line axis; creating a cutting or grinding action on the radius face of the borehole.

Tricone bits are designed to wear and deal with the end on and lateral shock loadings that are experienced in drilling.

The two types are either:

- Steel Tooth
- TCI bits (Tungsten Carbide Insert)

Which type of tricone you choose depends on the geology you are drilling in and the diameters of the borehole you are drilling.

The International Association of Drilling Contractors (IADC) have developed an easy use step system to choose the right tricone for your geology with additional features such as bit protection for longer production life.

Applications
- Geotechnical investigation
- Mining exploration & Probing
- Geotechnical instrumentation
- Geophysics

Features
- Made in the EU
- IADC codes
- TCI & Steel tooth options
- Additional tungsten carbide inserts on heel rows
- Tungsten carbide coating on cone bodies
- Diamond coated tungsten carbide inserts on the gauge of the cones
- Tungsten carbide inserts on the shirrtail of the legs
- Additional central nozzle for cleaning cones.

A unique feature of our tricones is that they come with their own passport, which provides:

- The specification of the cones
- The quality stamp signed by the person who made and checked the bit
- The recommended drilling parameters to get the best performance out of the bit:
  - Bit weight
  - Rotation speed
  - Flushing volume
**Tungsten Carbide (TC) Bits**

- **N** – Standard bit with open journal for various types of drilling;
- **NE** – Improved bit with open journal, tungsten carbide inserts on the gauge for various types of drilling
- **NS** – Standard bit with sealed journal having reliable lubrication of the bearing support
- **NSE** – Improved standard bit with sealed journal having increased rotation resource and improved wear resistance and improved cutting structure and bit stabilisation for extremely difficult types of drilling
- **NA** – Standard bit with air cleaning for different types of drilling operations using direct air circulation
- **NAR** – Standard bit with air cleaning for different types of drilling operations using reverse air circulation
- **NAS** – Standard bit with air cleaning characterised with lubrication of the sealed bearing and increased rotation resource for various types of drilling operations using direct air circulation

**Steel Toothed (ST) Bits**

- **N** – Standard bit with open journals for various types of drilling;
- **NE** – Improved bit with open journals, tungsten carbide inserts on the gauge for various types of drilling
- **NRS** – Standard bit with sealed roller bearings having reliable lubrication of the bearing support for the responsible types of drilling
- **NFSE** – Improved standard bit with sealed friction bearings with increased rotation resource and improved wear resistance and improved cutting structure and bit stabilization for extremely difficult types of drilling
- **NA** – Standard bit with air cleaning for different types of drilling operations using direct air circulation
- **NAR** – Standard bit with air cleaning for different types of drilling operations using reverse air circulation
- **NAS** – Standard bit with air cleaning characterised with lubrication of the sealed journals and increased rotation resource for various types of drilling operations using direct air circulation.

### Tungsten Carbide Inserts

<table>
<thead>
<tr>
<th>Form</th>
<th>Performance</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chisel</td>
<td>High penetration for plastic rock</td>
<td>Plastic rock soft &amp; medium hard</td>
</tr>
<tr>
<td>Conical</td>
<td>Same as chisel plus high breaking and rotation resistance</td>
<td>Fragile rocks medium to hard</td>
</tr>
<tr>
<td>Ball</td>
<td>Very high breaking resistance</td>
<td>Fragile rocks medium to hard</td>
</tr>
</tbody>
</table>
Bearing Types

There are primarily four types of bearing designs used in tricone drilling bits:

- **STANDARD OPEN BEARING ROLLER BIT: On these bits the cones will spin freely. This type of bit has a front row of ball bearings and a back row of roller bearings.**

- **STANDARD OPEN BEARING ROLLER BIT FOR AIR DRILLING: Cones are similar to number 1, but have air injection directly to the cones to cool the bearings. Air flows into the cone through the passageways inside the pin. (Not for mud applications)**

- **SEALED BEARING ROLLERS BITS These bits have an O-Ring seal with a grease reservoir for bearing cooling. The seals acts as a barrier against mud and cuttings to protect the bearings**

- **JOURNAL BEARING ROLLER BITS These bits are strictly oil/grease cooled with nose bearings, O-Ring seal and a race for maximum performance.**

### Threads

<table>
<thead>
<tr>
<th>Pin Thread</th>
<th>Roller bit size range (inch)</th>
<th>Roller bit size range (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-Rod</td>
<td>2-3/8 – 2-1/4</td>
<td>57.9 – 60.3</td>
</tr>
<tr>
<td>N-Rod</td>
<td>2-1/2 – 3-1/2</td>
<td>63.5 – 88.9</td>
</tr>
<tr>
<td>N-42</td>
<td>2-1/2 – 3</td>
<td>63.5 – 76.2</td>
</tr>
<tr>
<td>2-3/4</td>
<td>Reg 3-1/2 – 4-1/2</td>
<td>88.9 – 114.3</td>
</tr>
<tr>
<td>2-7/8</td>
<td>Reg 4-1/4 – 5-1/4</td>
<td>120.6 – 133.3</td>
</tr>
<tr>
<td>3-1/4</td>
<td>Reg 5-1/4 – 6-1/4</td>
<td>142.9 – 158.8</td>
</tr>
</tbody>
</table>

### IADC Codes

IADC Codes make it easier to describe what kind of rock bit is required. The first three digits classify the bit according to the formation it is designed to drill and the bearing/seal design used.

1, 2, and 3 designate STEEL TOOTH BITS with 1 for soft, 2 for medium and 3 for hard formations.

Codes 4, 5, 6, 7 and 8 designate TUNGSTEN CARBIDE INSERT BITS for varying formation hardness with 4 being the softest and 8 the hardest.

### Formation Types

The following shows the typical formation and its IADC reference

1 & 4 Soft formations with sticky layers and low compressive strength, such as clay, marls.

5 Soft to medium formations with low compressive strength and inter-bedded with hard layers, such as sands, shale and chalk.

2 or 6 Medium to hard dense formations with high to very high compressive strength, but with non-abrasive or small abrasive layers, such as shales, mudstone, sandstone, limestone, dolomite and anhydrite.

3 or 7 Hard and dense formations with very high compressive strength and some abrasive layers, such as siltstone, sandstone and mudstone.

8 Extremely hard and abrasive formations such as quartzite and volcanic rock.
**IADC Codes – Digits**

The first three digits classify the bit according to the formation it is designed to drill and the bearing/seal design used.

**First Digit**
1, 2, and 3 designate STEEL TOOTH BITS with 1 for soft, 2 for medium and 3 for hard formations.
4, 5, 6, 7 and 8 designate TUNGSTEN CARBIDE INSERT BITS for varying formation hardness with 4 being the softest and 8 the hardest.

**Second Digit**
1, 2, 3 and 4 are further breakdown of formation with 1 being the softest and 4 the hardest.

**Third Digit**
This digit will classify the bit according to bearing/seal type as follows:
- Standard open bearing roller bit
- Standard open bearing roller bit, air-cooled
- Standard open bearing roller bit with gauge protection which is defined as carbide inserts in the heel of the cone
- Sealed roller bearing bit
- Sealed roller bearing bit with gauge protection
- Journal sealed bearing bit
- Journal sealed bearing bit with gauge protection.

**Fourth Digit**
The following letter codes are used in the fourth digit position to indicate additional features:
- A. Air Application
- R. Reinforced Welds
- C. Centre Jet
- S. Standard Steel Tooth
- D. Deviation Control
- X. Chisel Insert
- E. Extended Jet
- Y. Conical Insert
- G. Extra Gage Protection
- Z. Other Insert Shape
- J. Jet Deflection