**Ton-Mile (TM) Calculations**

All types of ton-mile service should be calculated and recorded in order to obtain a true picture of the total service received from the rotary drilling line.

These include :

1. Round trip ton-miles  
2. Drilling or “connection” ton-miles  
3. Coring ton-miles  
4. Ton-miles setting casing  
5. Short-trip ton-miles

Round trip ton-miles (RTTM)

Where ;

RTTM = round trip ton-miles  
Wp = buoyed weight of drill pipe (lb/ft)  
D = depth of hole (ft)

Lp = length of one stand of drill pipe (ave) (ft)  
Wb = weight of traveling block assembly (lb)  
Wc = buoyed weight of drill collars in mud minus the buoyed weight of the

same length of drill pipe (lb)

2000 = number of pounds in one ton  
5280 = number of feet in one mile

Sample Case : Round trip ton-miles

Mud weight = 9.6 ppg  
Measured depth = 4000 ft  
Drill pipe weight = 13.3 lb/ft  
Drill collar weight = 83 lb/ft  
Drill collar length = 300 ft  
Traveling block assembly = 15,000 Ib  
Average length of one stand = 60 ft (double)

Solution :

a. Buoyancy factor :

BF = 65.5 – 9.6 ppg : 65.5

= 0.8534

b. Buoyed weight of drill pipe in mud (b/ft) (Wp):

Wp = 13.3 lb/ft x 0.8534

= 11.35 lb/ft

c. Buoyed weight of drill collars in mud minus the buoyed weight of the

same length of drill pipe (lb) (Wc):

Wc = (300 x 83 x 0.8534) — (300 x 13.3 x O.8534)

= 21,250 — 3,405

= 17,845 lb

**Drilling or “Connection” ton-miles**

The ton-miles work performed in drilling operations is expressed in terms of work performed in making round trips. These are the actual ton-miles of work in drilling down the length of a section of pipe (usually approximately 30 ft) plus picking up, connecting, and starting to drill with the next section.

To determine connection or drilling ton-miles, take 3 times (ton-miles for current round trip minus ton-miles for previous round trip):

Td = 3 (T2 – T1)

Where ;

Td = drilling or “connection” ton-miles  
T2 = ton-miles for one round trip — depth where drilling stopped before

coming out of hole  
T1 = ton-miles for one round trip — depth where drilling started

Sample Case : Ton-miles for trip @ 4600 ft = 64.6  
 Ton-miles for trip @ 4000 ft = 53.7

Td = 3 x (64.6— 53.7)

= 3 x 10.9

= 32.7 ton-miles

**Ton-miles during coring operations**

The ton-miles of work performed in coring operations, as for drilling operations is expressed in terms of work performed in making round trips.

To determine ton-miles while coring, take 2 times ton-miles for one round trip at the depth where coring stopped minus ton-miles for one round trip at the depth where coring began ;

Tc = 2 (T4 – T3)

Where ;

Tc = ton-miles while coring  
T4 = ton-miles for one round trip — depth where coring stopped before

coming out of hole  
T3 = ton-miles for one round trip — depth where coring started after going

in hole

**Ton-miles setting casing**

The calculations of the ton-miles for the operation of setting casing should be determined as for drill pipe, but with the buoyed weight of the casing being used, and with the result being multiplied by one-half, because setting casing is a one-way (1/2 round trip) operation. Ton-miles for setting casing can be determined from the following formula :

Where ;

Tc = ton-miles setting casing  
Wp = buoyed weight of casing (lb/ft)  
Lcs = length of one joint of casing (ft)  
Wb = weight of traveling block assembly (lb)

**Ton-miles while making short trip**

The ton-miles of work performed in short trip operations as for drilling and coring operations, is also expressed in terms of round trips. Analysis shows that the ton-miles of work done in making a short trip is equal to the difference in round trip ton-miles for the two depths in question.

Tst = T6 — T5

Where ;

Tst = ton-miles for short trip  
T6 = ton-miles for one round trip at the deeper depth, the depth of the

bit before starting the short trip  
T5 = ton-miles for one round trip at the shallower depth, the depth that

the bit is pulled up to