

# Turbine Terminology

## 200.E.01

- 1. DATUM OR GRADE** – The elevation of the surface from which the pump is supported.
- 2. STATIC WATER LEVEL** – The vertical distance from grade to the water level when no water is being drawn from the well.
- 3. DRAWDOWN** – The distance between the static water level and the water level when pumping at required capacity.
- 4. PUMPING WATER LEVEL** – The vertical distance from grade to water level when pumping at required capacity. **Pumping Water Level** equals **Static Water Level** plus **Drawdown**.
- 5. SETTING** – The distance from grade to the top of the pump bowl assembly.
- 6. FIELD PUMPING HEAD** – Lift below discharge plus head above discharge plus friction losses in discharge line. This is the head for which the customer is responsible and does not include any losses within the pump.
- 7. COLUMN FRICTION LOSS** – Head loss in the pump due to friction in the column assembly. Friction loss is measured in feet and is dependent upon column and shaft size and setting. Values given in chart, page 200.B1.
- 8. TDH (LAB HEAD)** – Total head which the pump bowl assembly must deliver at the given capacity. **TDH** equals **Field Pumping Head** plus **Column Friction Loss**.
- 9. LABORATORY EFFICIENCY** – The efficiency of the bowl unit only. This value is read directly from the performance curve.
- 10. LABORATORY HORSEPOWER** – The horsepower required by the bowls only to deliver a given capacity against Laboratory Head.

$$\text{LAB HP} = \frac{\text{TDH} \times \text{Capacity}}{3960 \times \text{Laboratory Efficiency}}$$

- 11. SHAFT FRICTION LOSS** – The horsepower required to turn the lineshaft in the bearings. These values are given in chart, page 200.B3.
- 12. FIELD HORSEPOWER OR BRAKE HORSEPOWER** – Sum of **Laboratory Horsepower** plus **Shaft Loss** (and the driver thrust bearing loss under certain conditions).

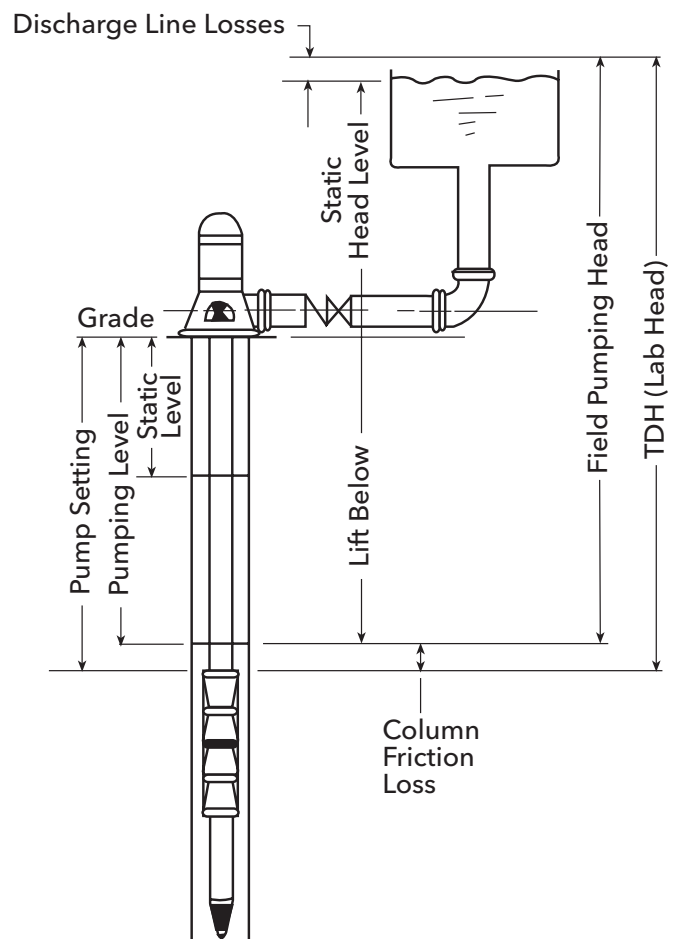
- 13. PUMP FIELD EFFICIENCY (WATER TO WATER)** – The efficiency of the complete pump less the driver, with all losses between laboratory and field performance being taken into account.

$$\text{Field Efficiency} = \frac{\text{Field Pumping Head} \times \text{Capacity}}{3960 \times \text{Brake Horsepower}}$$

- 14. TOTAL PUMP THRUST** – The sum of the weight of the shaft plus hydraulic thrust of the liquid being pumped. Chart, page 200.B2 gives shaft weight per foot. Performance curves give hydraulic "K" factor. Total thrust equals:

$$\text{Shaft Wt. Per Foot} \times \text{Setting in Feet} + "K" \times \text{TDH}$$

- 15. OVERALL EFFICIENCY (WIRE TO WATER)** – The efficiency of the pump and motor complete. Overall efficiency = Pump Field Efficiency x Motor Efficiency.



# DWT Turbine Pump Selection Procedure

## 200.E.02

**1. TENTATIVE BOWL SELECTION** – Select best bowl assembly for capacity and head, pumping conditions and well size. Curves are drawn per stage so head per stage must be multiplied by the number of stages required.

- (a) Add 5 feet column friction loss per 100 feet of column to field pumping head to determine approximate TDH. Choose best pump, keeping well diameter and engineering limitations in mind. To determine number of stages required, divide TDH by head per stage of selected turbine bowl.
- (b) Record efficiency for number of stages used. Note that up to 4 or 5 stages, efficiency may have to be reduced per chart on right hand side of curve.
- (c) Calculate laboratory horsepower from curve or by formula:

$$HP = \frac{\text{Capacity} \times \text{TDH}}{3960 \times \text{Corrected Laboratory Efficiency}}$$

- (d) Calculate approximate thrust = TDH x "K" (from performance curve) x specific gravity for liquids other than fresh water.

### 2. LINESHAFT SELECTION

- (e) Size lineshaft for horsepower under (c) from horsepower chart, page 200.B3.
- (f) Calculate thrust due to lineshaft weight from horsepower chart, page 200.B2. Thrust due to shaft weight equals weight per foot x setting in feet.
- (g) Add (f) and (d) for total thrust. Check that lineshaft will take thrust load from horsepower chart, page 200.B3.

### 3. COLUMN SELECTION

- (h) Select column size for required capacity from Column Friction Loss chart, page 200.B1. Choose column with losses in the bold figures, unless setting is very short, making column friction negligible.

### 4. FINAL BOWL SELECTION

- (i) Calculate column friction loss by multiplying loss per 100 feet under (h) x number of 100 feet lengths.
- (j) Add (i) to Field Pumping Head. This gives final TDH.
- (k) Reselect number of stages and head per stage for new head under (j).
- (l) Calculate new Laboratory Horsepower from curve or formula:

$$HP = \frac{\text{Capacity} \times \text{Final TDH}}{3960 \times \text{Corrected Laboratory Efficiency}}$$

### 5. CHECK LINESHAFT SIZE

- (m) Check that lineshaft can carry new horsepower under (l).
- (n) Check lineshaft stretch, page 200.B4. If stretch is greater than lateral adjustment, consult factory or choose next larger shaft size, use "K" Factor Thrust only.

### 6. BRAKE HORSEPOWER CALCULATION

- (o) Calculate shaft friction loss from Table, page 200.B2 number of 100 feet lengths. Add this to (l) for brake horsepower required.

### 7. DRIVER SIZE

- (p) Select the driver size based on the brake horsepower speed and total thrust (g). Record driver B.D.

### 8. DISCHARGE HEAD

- (q) Select discharge head for column and shaft size and driver B.D. dimension. Check setting, total weight and thrust values Section 3A.2B4W to be sure values are not exceeded.

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