

Company: Bonneville Power Administration  
 Name:  
 Date: 11/29/2006  
 Selection: Missing Fairbanks Vertical Turbines



#### Pump:

Size: 19A.1 (1 stage)  
 Type: VERT.TURBINE  
 Synch speed: 1800 rpm  
 Curve: 18-191  
 Specific Speeds:  
 Dimensions:  
 Vertical Turbine:  
 Speed: 1770 rpm  
 Dia: 14.36 in  
 Impeller:  
 Ns: ---  
 Nss: ---  
 Suction: 17.25 in  
 Discharge: 14 in  
 Bowl size: 18.5 in  
 Max lateral: 0.62 in  
 Thrust K factor: 32 lb/ft

#### Search Criteria:

Flow: --- US gpm  
 Head: --- ft

#### Fluid:

Water  
 Density: 62.25 lb/ft<sup>3</sup>  
 Viscosity: 1.105 cP  
 NPSHa: --- ft  
 Temperature: 60 °F  
 Vapor pressure: 0.2563 psi a  
 Atm pressure: 14.7 psi a

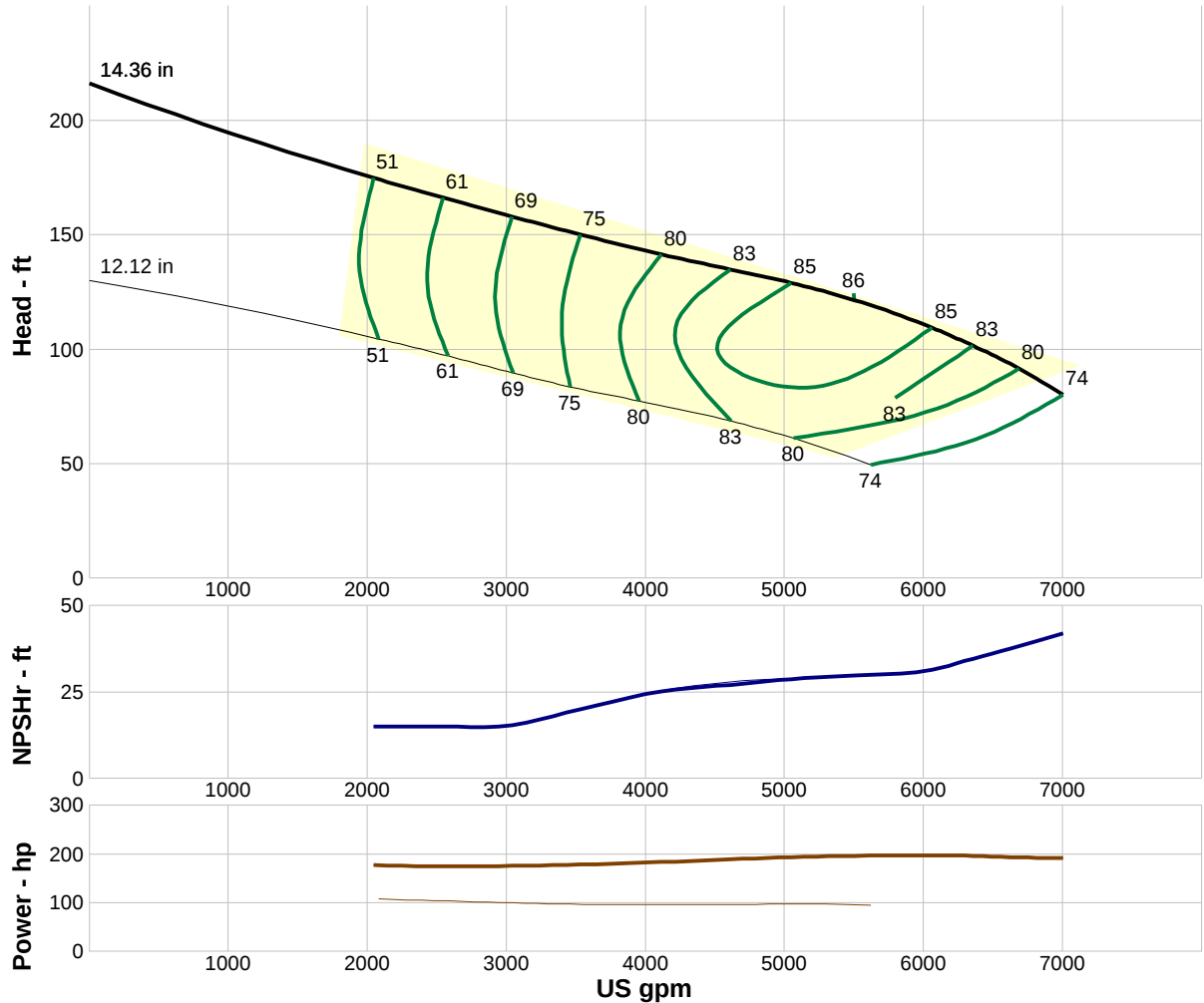
#### Motor:

Standard: NEMA  
 Enclosure: TEFC  
 Sizing criteria: Max Power on Design Curve  
 Size: 200 hp  
 Speed: 1800  
 Frame: 447T

#### Pump Limits:

Temperature: 150 °F  
 Pressure: 300 psi g  
 Sphere size: 1.25 in  
 Power: 651 hp  
 Eye area: --- in<sup>2</sup>

| ---- Data Point ----   |                      |
|------------------------|----------------------|
| Flow:                  | 5498 US gpm          |
| Head:                  | 122 ft               |
| Eff:                   | 86%                  |
| Power:                 | 196 hp               |
| NPSHr:                 | 29.8 ft              |
| ---- Design Curve ---- |                      |
| Shutoff head:          | 216 ft               |
| Shutoff dP:            | 93.4 psi             |
| Min flow:              | --- US gpm           |
| BEP:                   | 86% @ 5498 US gpm    |
| NOL power:             | 197 hp @ 6059 US gpm |
| -- Max Curve --        |                      |
| Max power:             | 197 hp @ 6059 US gpm |



#### Performance Evaluation:

| Flow<br>US gpm | Speed<br>rpm | Head<br>ft | Efficiency<br>% | Power<br>hp | NPSHr<br>ft |
|----------------|--------------|------------|-----------------|-------------|-------------|
| 6720           | 1770         | 90.2       | 79.3            | 193         | 38.7        |
| 5600           | 1770         | 119        | 85.8            | 196         | 30.1        |
| 4480           | 1770         | 137        | 82.2            | 188         | 26.6        |
| 3360           | 1770         | 153        | 72.9            | 177         | 18.5        |
| 2240           | 1770         | 171        | 54.9            | 176         | 15          |

Company: Bonneville Power Administration  
 Name:  
 Date: 11/29/2006  
 Selection: Missing Fairbanks Vertical Turbines



#### Pump:

Size: 19A.2+ (2 stage)  
 Type: VERT.TURBINE  
 Synch speed: 1800 rpm  
 Curve: 18-191A  
 Specific Speeds:  
 Dimensions:  
 Vertical Turbine:  
 Speed: 1770 rpm  
 Dia: 14.36 in  
 Impeller:  
 Ns: ---  
 Nss: ---  
 Suction: 22.5 in  
 Discharge: 14 in  
 Bowl size: 18.5 in  
 Max lateral: 0.62 in  
 Thrust K factor: 32 lb/ft

#### Search Criteria:

Flow: --- US gpm Head: --- ft

#### Fluid:

Water  
 Density: 62.25 lb/ft<sup>3</sup>  
 Viscosity: 1.105 cP  
 NPSHa: --- ft  
 Temperature: 60 °F  
 Vapor pressure: 0.2563 psi a  
 Atm pressure: 14.7 psi a

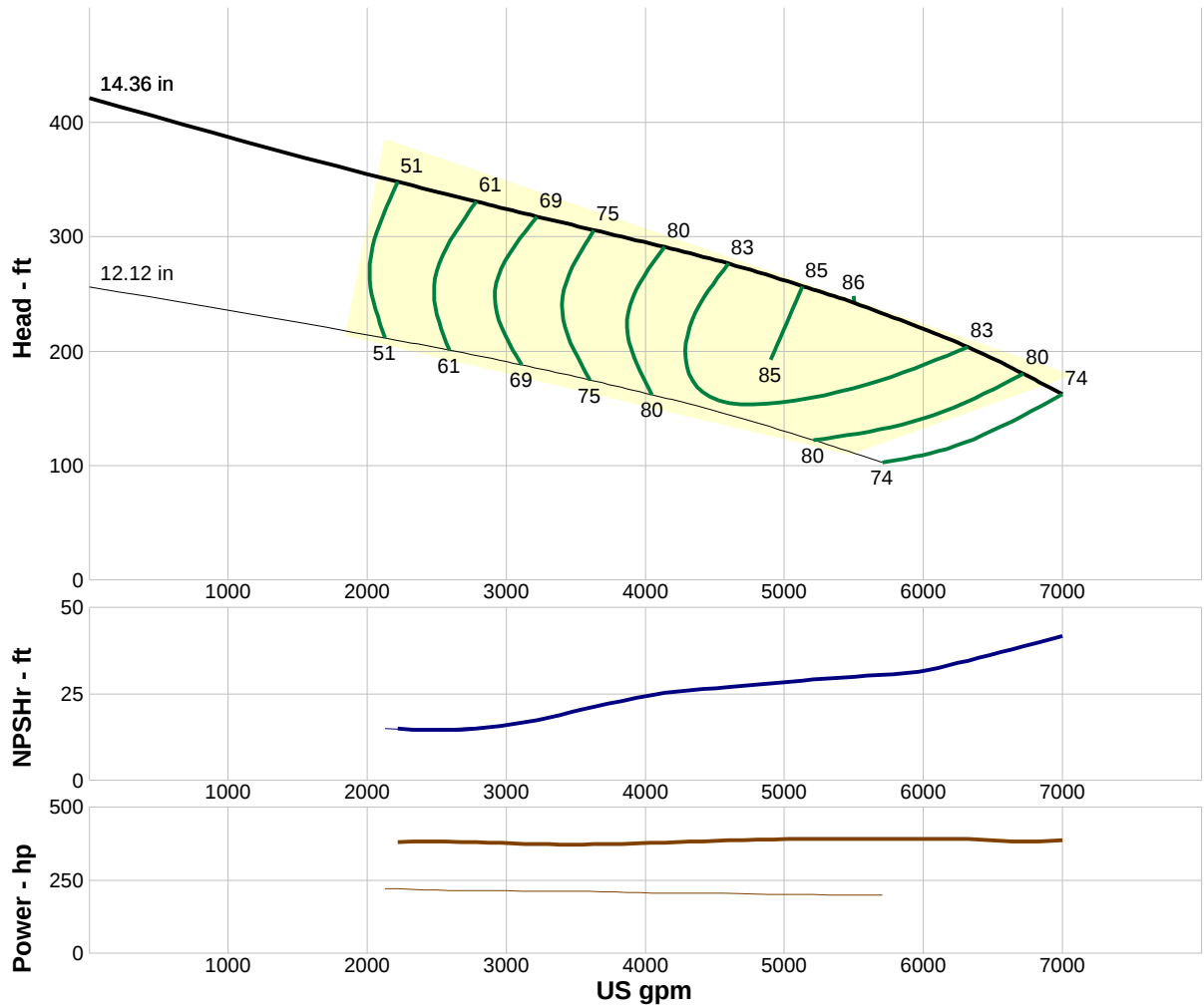
#### Motor:

Standard: NEMA  
 Enclosure: TEFC  
 Sizing criteria: Max Power on Design Curve  
 Size: 400 hp  
 Speed: 1800  
 Frame: 449T

#### Pump Limits:

Temperature: 150 °F  
 Pressure: 300 psi g  
 Sphere size: 1.25 in  
 Power: 651 hp  
 Eye area: --- in<sup>2</sup>

| ---- Data Point ----   |                      |
|------------------------|----------------------|
| Flow:                  | 5499 US gpm          |
| Head:                  | 242 ft               |
| Eff:                   | 86%                  |
| Power:                 | 391 hp               |
| NPSHr:                 | 30.1 ft              |
| ---- Design Curve ---- |                      |
| Shutoff head:          | 421 ft               |
| Shutoff dP:            | 182 psi              |
| Min flow:              | --- US gpm           |
| BEP:                   | 86% @ 5499 US gpm    |
| NOL power:             | 392 hp @ 6315 US gpm |
| -- Max Curve --        |                      |
| Max power:             | 392 hp @ 6315 US gpm |



#### Performance Evaluation:

| Flow<br>US gpm | Speed<br>rpm | Head<br>ft | Efficiency<br>% | Power<br>hp | NPSHr<br>ft |
|----------------|--------------|------------|-----------------|-------------|-------------|
| 6715           | 1770         | 180        | 80              | 382         | 38.8        |
| 5596           | 1770         | 238        | 85.8            | 391         | 30.4        |
| 4477           | 1770         | 280        | 82.2            | 385         | 26.6        |
| 3358           | 1770         | 314        | 71.1            | 374         | 18.8        |
| 2238           | 1770         | 347        | 51.4            | 381         | 15          |