

TAS Engineering Software Design

Testbed Software

Performance Test Results

Test Number:

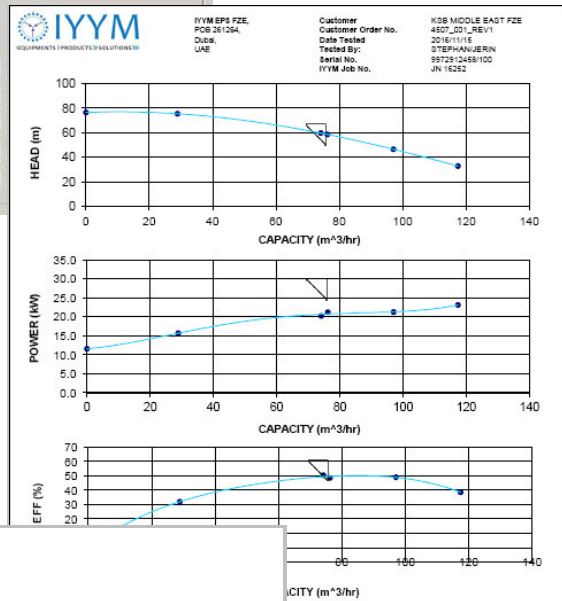
| Reading No: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | | |
|---------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|---|---|
| Suction Head: | m | 1.19 | 1.09 | 0.95 | 0.81 | 0.68 | 0.51 | 0.41 | 0 | 0 |
| Discharge Head: | m | 28.33 | 27.72 | 26.6 | 24.46 | 22.93 | 21.91 | 19.25 | 0 | 0 |
| Vel Head Suction: | m | 0 | 0.01 | 0.04 | 0.08 | 0.12 | 0.15 | 0.21 | 0 | 0 |
| Vel Head Discharge: | m | 0 | 0.24 | 0.57 | 1.22 | 1.9 | 2.42 | 3.41 | 0 | 0 |
| Velocity Head: | m | 0 | 0.22 | 0.53 | 1.14 | 1.78 | 2.27 | 3.2 | 0 | 0 |
| Diff Head: | m | 28.14 | 28.15 | 27.48 | 25.08 | 25.33 | 24.86 | 23.35 | 0 | 0 |
| Flow Rate: | m ³ /hr | 0 | 8.8 | 13.7 | 20 | 25 | 28.2 | 33.5 | 0 | 0 |
| Motor Input: | kW | 2.4 | 2.56 | 2.88 | 3.2 | 3.36 | 3.74 | 4 | 0 | 0 |
| Motor Output: | kW | 1.84 | 1.93 | 2.26 | 2.54 | 2.68 | 3.02 | 3.24 | 0 | 0 |
| Pump Power Output: | kW | 0 | 0.87 | 1.02 | 1.42 | 1.72 | 1.91 | 2.13 | 0 | 0 |

CORRECTED RESULTS BASED ON : Speed: 2950 RPM Impeller Diameter: 142 mm SG: 1.3

| | Speed | rpm | 2950 | 2950 | 2950 | 2950 | 2950 | 2950 | 2950 |
|------------|--------------------|-------|-------|-------|-------|-------|-------|-------|------|
| Capacity | m ³ /hr | 0 | 8.73 | 13.61 | 19.87 | 24.87 | 28.09 | 33.39 | |
| Total Head | m | 27.59 | 27.72 | 27.13 | 25.75 | 25.07 | 24.65 | 23.19 | |
| Power | kW | 2.33 | 2.52 | 2.88 | 3.24 | 3.43 | 3.87 | 4.17 | |
| Efficiency | % | 0 | 34 | 45.29 | 55.84 | 64.26 | 63.24 | 65.68 | |

Input directly from test data and produce a detailed technical specification and test curve. Includes customer details, pump information, test conditions, field ratings and a wide range of graphing options.

The output is compatible with GRAFTEC for the further analysis of data. Information can either be fed manually into TESTBED, or it can be interfaced directly to the facility for online measurement of data.



CENTRIFUGAL PERFORMANCE TEST REPORT

| Pump Model | | Customer | | IYYM Job No. | Customer Item No. | Customer Order No. | Pump Serial No. |
|--------------------------|-----------------------|---------------------|------------|-------------------------------|-------------------|--------------------|-----------------|
| RPH 56 080 280 | | KSB MIDDLE EAST FZE | | JM 16252 | | 4607_001_REV1 | 9972912458/100 |
| Field Rating | Test Rating | A/RM Deviation | Acceptance | Nominal Diameter | Inside Diameter | | |
| 87.60 m | 58.79 m | -12.3 | 3 | 100 mm | 103.5 mm | | |
| 30 kW | 20.50 kW | -31.7 | 4 | 80 mm | 77.9 mm | | |
| 76.02 m ³ /hr | 76 m ³ /hr | 0 | 0 | Test Motor | WEG MOTOR | | |
| 80.9 % | 56.3 % | N/A | N/A | API 610 10th Edition 141-300m | | | |
| 2955 RPM | 2955 RPM | | | | | | |
| Sp. Gravity | 0.850 | | | | | | |
| Viscosity | 1 cSt | | | | | | |
| Gauge to Gauge Elev. | | | | 0.3 m | Imp Test Dia (mm) | 234.00 | |
| Suction Bar gauge | | Discharge Bar gauge | | Capacity | | Power Calculation | |
| Value | Value | Value | Value | Flow Rate | Voltage | Motor Input | Motor Output |
| RPM | Bar | m | Bar | m | 384 V | Motor Input | Motor Output |
| 1 | 2955 | 0.95 | 0.61 | 7.63 | 76.93 | 0.00 | 0.00 |
| 2 | 2955 | 0.91 | 0.60 | 7.97 | 76.90 | 0.08 | 0.08 |
| 3 | 2955 | 0.86 | 0.61 | 5.72 | 58.44 | 0.51 | 0.86 |
| 4 | 2955 | 0.97 | 0.72 | 5.99 | 57.01 | 0.54 | 0.86 |
| 5 | 2955 | 0.94 | 0.63 | 4.31 | 44.03 | 0.97 | 1.60 |
| 6 | 2955 | 0.92 | 0.25 | 2.85 | 29.13 | 1.27 | 32.84 |



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TAS Engineering Software Design

Automated Testbed

Fully automated pump test rig.

- Real time monitoring
 - Schematic of test bed on the screen, user taps on the screen to set parameters below.
 - Motor started and stopped.
 - Increase / decrease speed for VFD.
- Real time control
 - All live values are read off the screen from the field instruments (pressure transmitters, flow meter, VSD for power and pump speed).
 - Calculated values such as total dynamic head, pump efficiency, specific energy, Q_{bep} etc are displayed live on the screen.

The software can compare the test duty with the optimum duty point from the supplier curve, and calculate the flow, head, eff and power deviations.

The screenshot displays the TAS Engineering software interface for a pump test rig. The main window shows a schematic of the test bed with various parameters: Flow Rate (4.10 l/s), Downstream Pressure (7.81 kPa), Motor Power (4.53 kW), Pump Efficiency (31.65%), Specific Energy (5045.26 kJ/kWh), Discharge Pressure (53.14 kPa), Discharge Tank, Level (0-50), Pump Speed (2938.67 rpm), and Suction Pressure (26.68 kPa). A 'STOPPED' status is indicated.

A 'Test Summary Sheet' window shows a table of test data:

| Connected To | Field Rating | Test Duty | Actual | Pump RFP | Viscosity |
|--------------|--------------------|-----------|-----------|----------|-------------|
| PSFB | Legend | Legend | Deviation | Waste | Corrections |
| Flow | m ³ /hr | 0 | 0 | 0 | 0 |
| Head | m | 0 | 0 | 0 | 0 |
| Efficiency | % | 0 | 0 | 0 | 0 |
| Power | kW | 0 | 0 | 0 | 0 |
| NPSH | m | 0 | 0 | 0 | 0 |

Test Time: 142 min, Required Time: 140.61 min, % Change Required: 0.99 %.

A 'Monitor' window shows a graph of Head (m) vs. Flow (m³/hr) with a red line representing the test curve. The y-axis ranges from 15 to 22, and the x-axis ranges from 25 to 90.

A 'Test Summary' window shows a table of test data:

| Reading No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|--------------------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| Suction Head | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Discharge Head | 22.94 | 21.15 | 20.69 | 19.16 | 17.63 | 15.65 | 13.95 | 10.86 | 8.47 |
| Vol Head Suction | 0 | 0.04 | 0.07 | 0.14 | 0.24 | 0.38 | 0.55 | 0.81 | 1.22 |
| Vol Head Discharge | 0 | 0.04 | 0.07 | 0.14 | 0.24 | 0.38 | 0.55 | 0.81 | 1.22 |
| Velocity Head | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Diff Head | 24.44 | 22.65 | 22.19 | 20.66 | 19.13 | 17.15 | 14.95 | 12.36 | 9.97 |
| Flow Rate | 0 | 25 | 33 | 47 | 61.24 | 76.76 | 93 | 112.52 | 138 |
| Motor Input | 8.31 | 8.29 | 8.63 | 10.19 | 10.88 | 11.02 | 11.5 | 12.96 | 13.38 |
| Motor Output | 7.38 | 8.29 | 8.66 | 9.12 | 9.76 | 9.89 | 10.33 | 11.69 | 12.86 |
| Pump Power Output | 0 | 1.54 | 1.99 | 2.64 | 3.19 | 3.58 | 3.68 | 3.78 | 3.74 |

Corrected Results Based On: Speed 1465 RPM, Impeller Diameter 270 mm, SG 1.

| Speed | 1465 | 1465 | 1465 | 1465 | 1465 | 1465 | 1465 | 1465 | 0 |
|------------|-------|-------|-------|-------|-------|-------|-------|--------|-------|
| Capacity | 0 | 25 | 33 | 47 | 61.24 | 76.76 | 93 | 112.52 | 138 |
| Total Head | 24.44 | 22.65 | 22.19 | 20.66 | 19.13 | 17.15 | 14.95 | 12.36 | 9.97 |
| Power | 7.38 | 8.29 | 8.66 | 9.12 | 9.76 | 9.89 | 10.33 | 11.69 | 12.86 |
| Efficiency | % | 0 | 18.98 | 23 | 28.95 | 32.65 | 36.22 | 35.63 | 32.4 |

Actual Readings: Reading No: 9, Actual Readings: 8, Last Saved Readings: 8. Motor Status: Running. Calculated Values: Flow 136, Head 10.2634, Eff 39.6481, Power 11.9979. Valve position 4 %.



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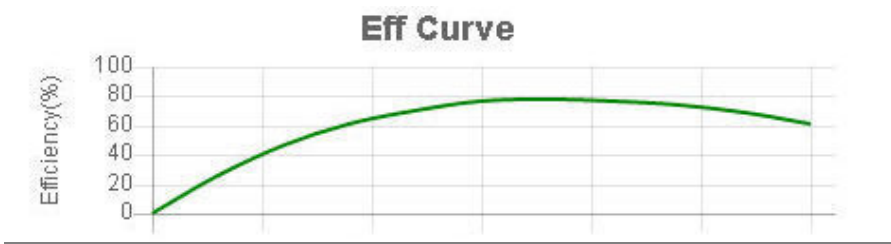
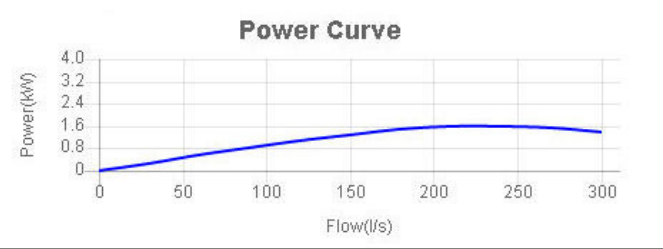
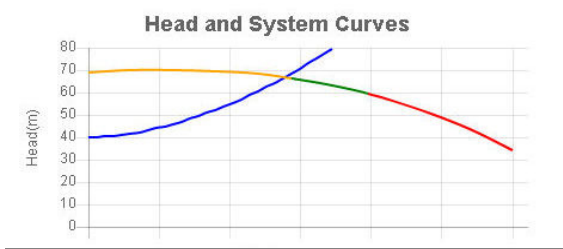
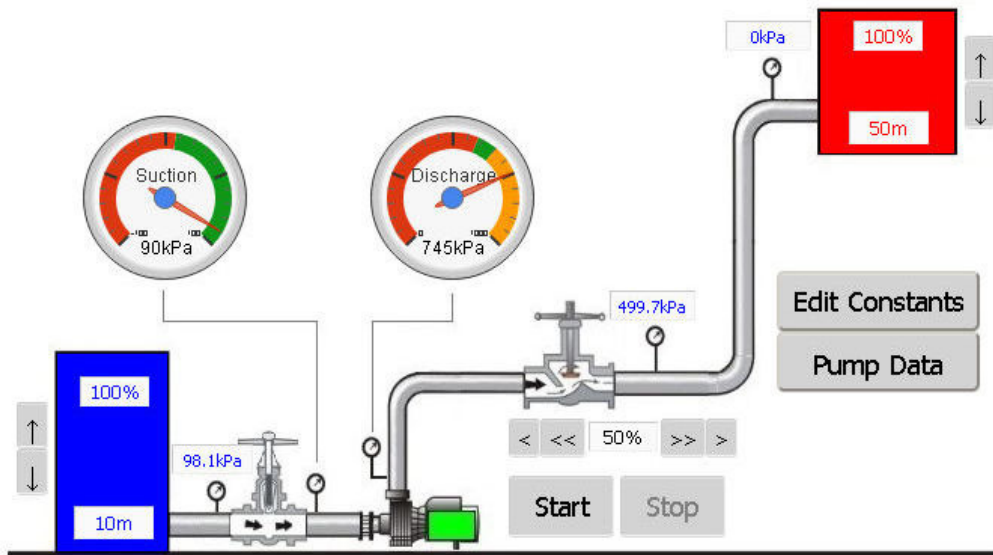
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TAS Engineering Software Design

Virtual Pump Simulator

| | | | | | |
|------------|---------|-------------|---------|------|-----|
| Flow Rate | 139.2/s | kW Absorbed | 128.6kW | QBep | 175 |
| Total Head | 66.8m | Efficiency | 74.8% | | |



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