Electronic Data Exchange (EDE) in the Pump Industry

An Overview of the HI EDE Standard

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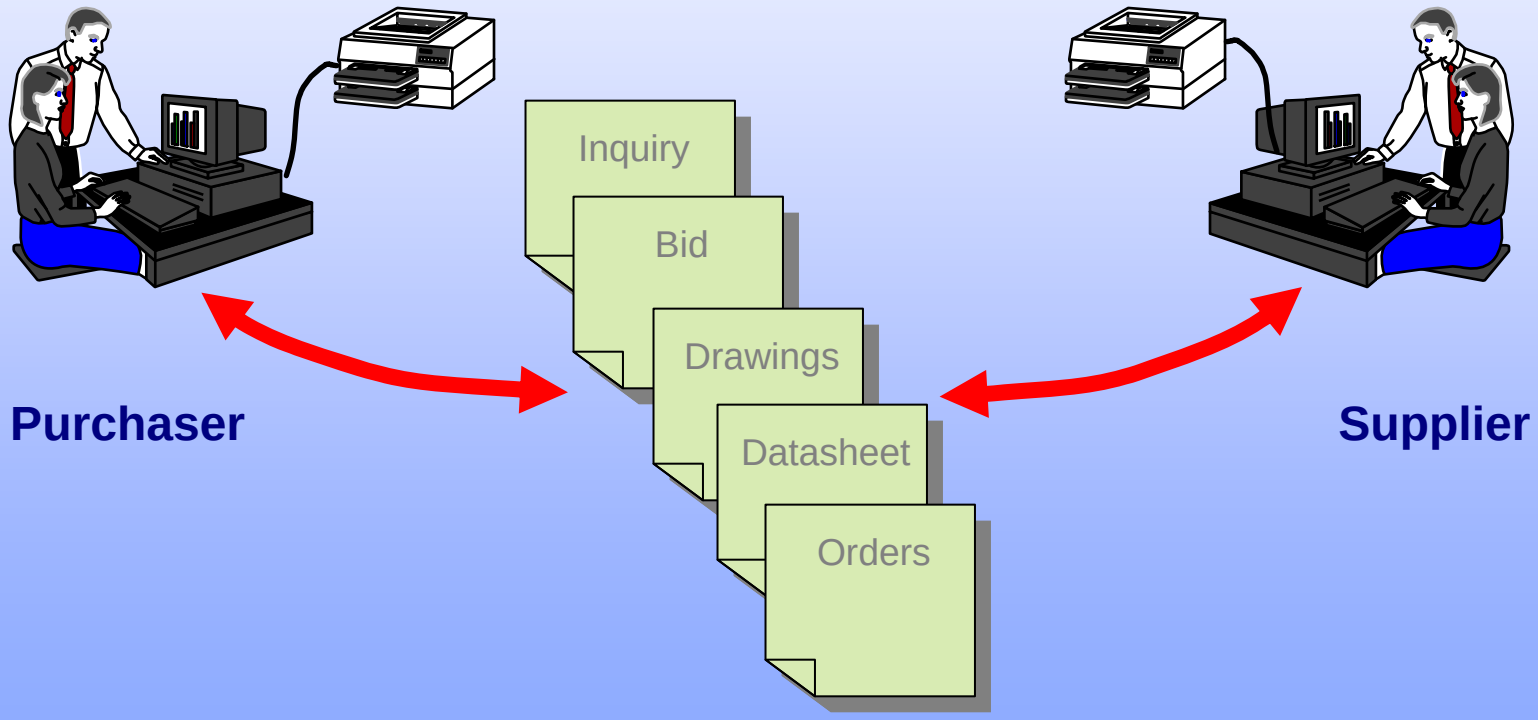
Intelliquip, LLC

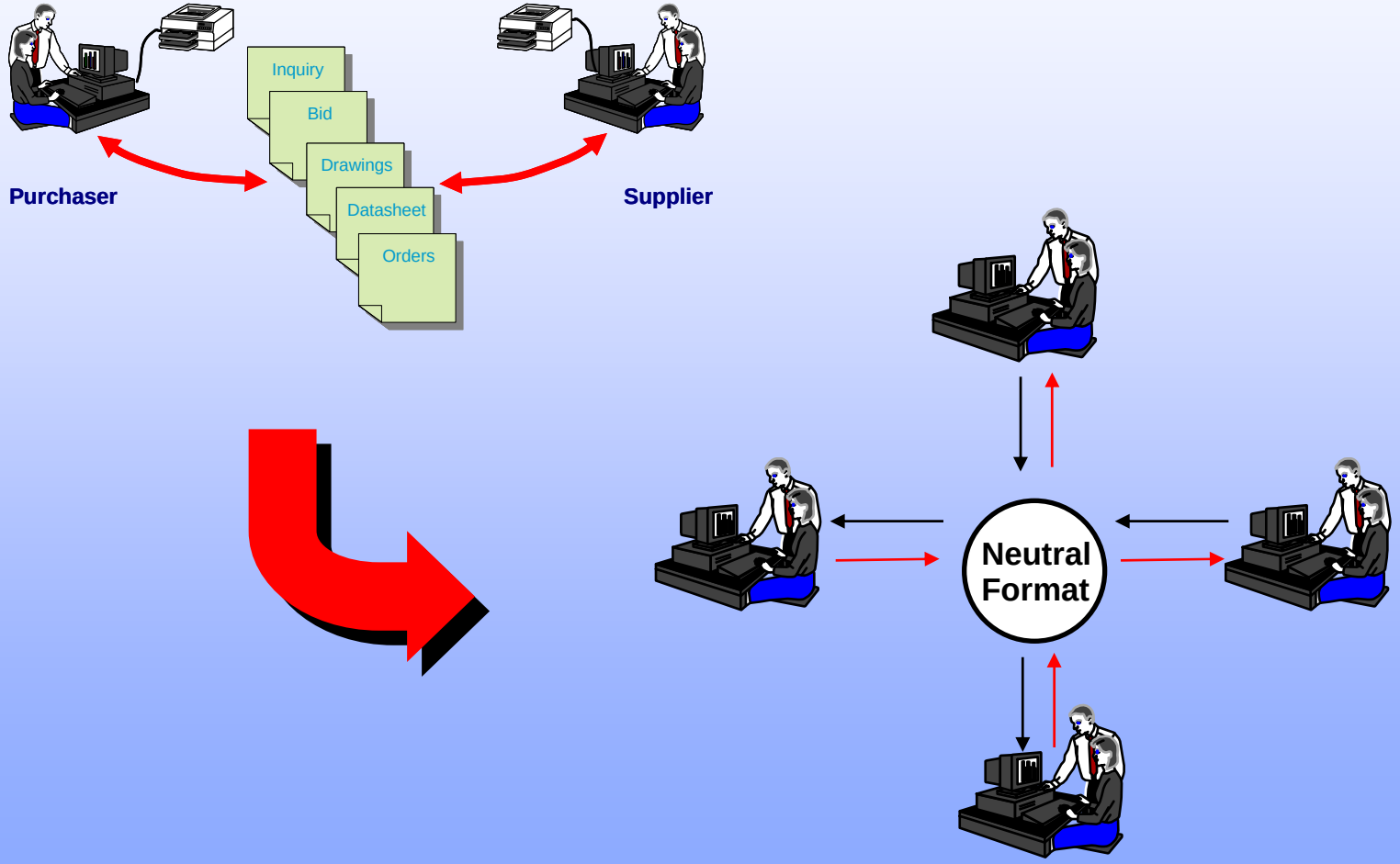
Technical Information Exchange

Case for Electronic Data Exchange

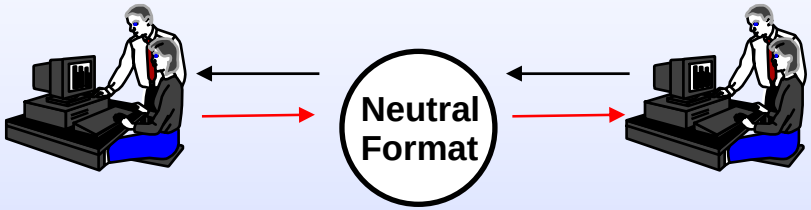


Unfortunately, this still involves “manual” re-entry of data.

Electronic Data Exchange



Electronic Data Exchange - Definitions

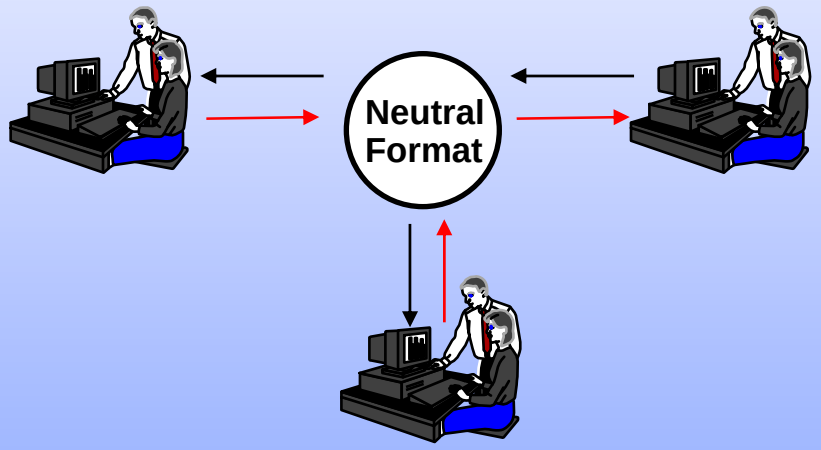


- Every Neutral File Format has a *Schema*
  - *Schema* is a description of the structure of a database or file

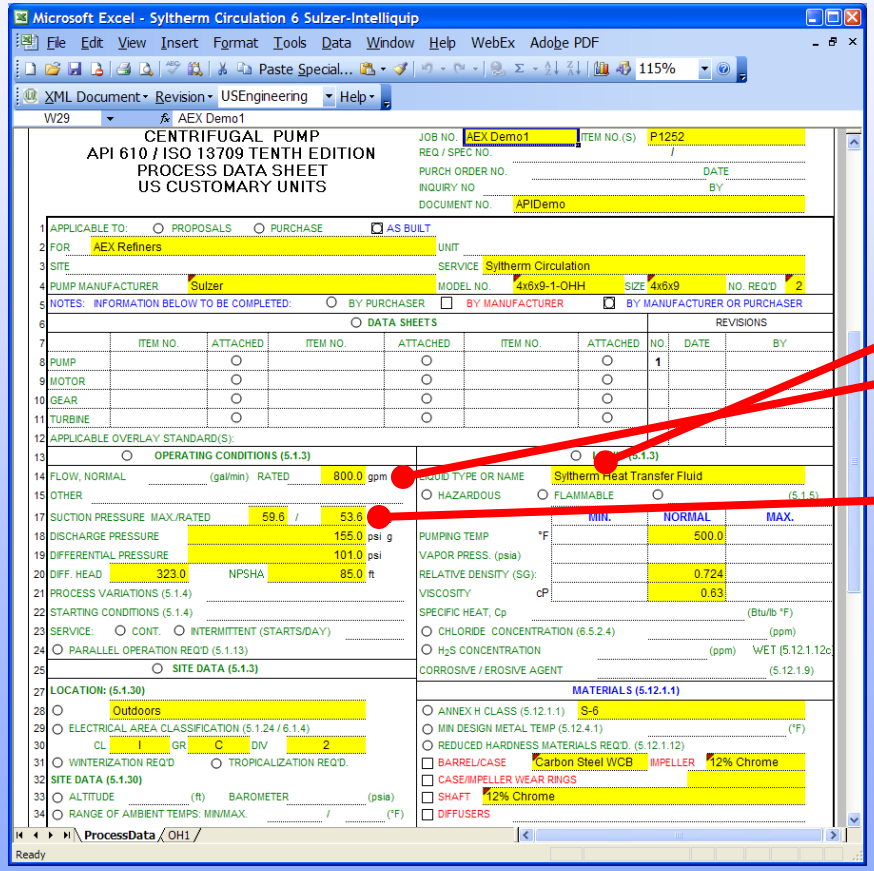
- *XML* schema
  - XML is a user-definable text file format that provides the capability to store highly structured digital information
  - XML = eXtensible Markup Language
  - XML will work on virtually any computer hardware and operating system platform.
  - Widely recognized standard for exchanging data on the Internet

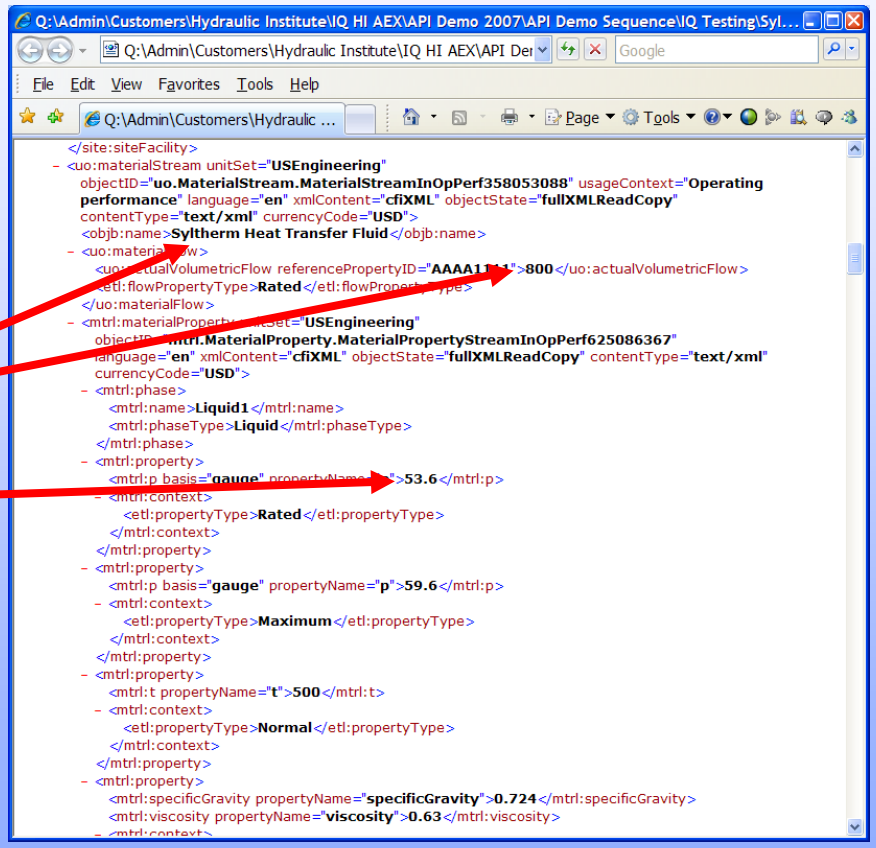
Electronic Data Exchange - Summary

- With a Neutral Format
  - 1 standard adopted
  - Each firm required to support 2 translators
- The approach…
  - Electronic data exchange must be developed or supported by standards organizations such as:
    - AEX / FIATECH
    - API / ISO
    - Hydraulic Institute
    - PIP



XML Example
API 610 Pump Datasheet

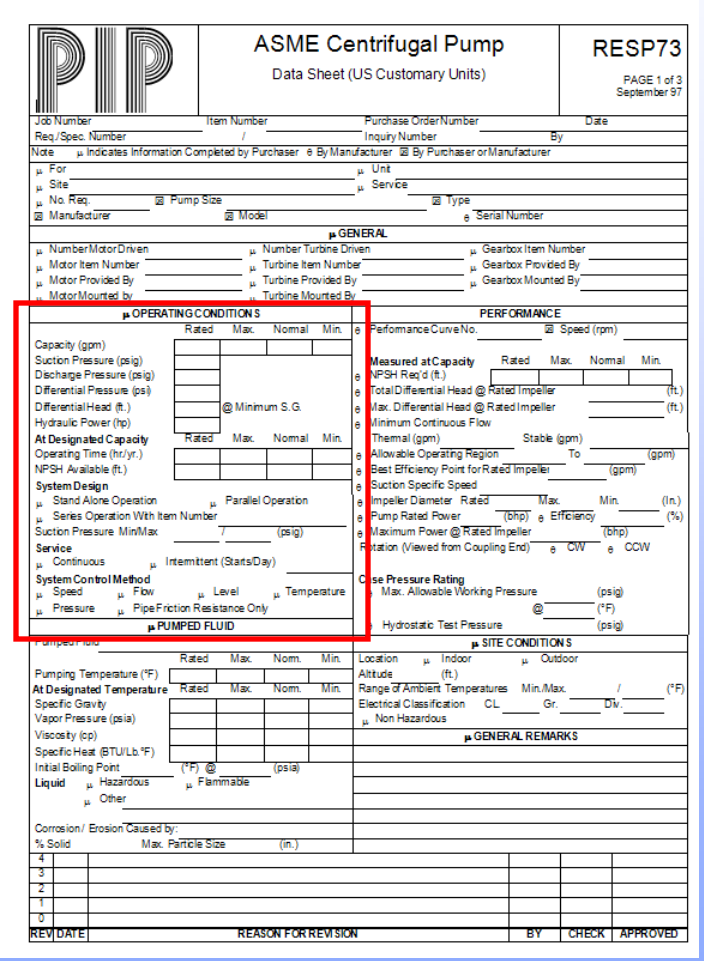




API 610 Pump Datasheet shown in Excel

Underlying XML representation

Mapping Data Fields from Pump Datasheet



ASME Centrifugal Pump
Data Sheet (US Customary Units)
RESP73
PAGE 1 of 3
September 97

Job Number | Item Number | Purchase Order Number | Date
Req./Spec. Number / | Inquiry Number | By
Note µ Indicates Information Completed by Purchaser e By Manufacturer ☒ By Purchaser or Manufacturer

µ For | µ Unit
µ Site | µ Service
µ No. Req. | ☒ Pump Size | ☒ Type
☒ Manufacturer | ☒ Model | e Serial Number

µ GENERAL

µ Number Motor Driven | µ Number Turbine Driven | µ Gearbox Item Number
µ Motor Item Number | µ Turbine Item Number | µ Gearbox Provided By
µ Motor Provided By | µ Turbine Provided By | µ Gearbox Mounted By
µ Motor Mounted By | µ Turbine Mounted By

µ OPERATING CONDITIONS

	Rated	Max.	Normal	Min.
Capacity (gpm)				
Suction Pressure (psig)				
Discharge Pressure (psig)				
Differential Pressure (psi)				
Differential Head (ft.)			@ Minimum S.G.	
Hydraulic Power (hp)				
At Designated Capacity	Rated	Max.	Normal	Min.
Operating Time (hr/yr.)				
NPSH Available (ft.)				

System Design
µ Stand Alone Operation µ Parallel Operation
µ Series Operation With Item Number
Suction Pressure Min/Max / (psig)
Service
µ Continuous µ Intermittent (Starts/Day)
System Control Method
µ Speed µ Flow µ Level µ Temperature
µ Pressure µ Pipe Friction Resistance Only

µ PUMPED FLUID

	Rated	Max.	Nom.	Min.
Pumping Temperature (°F)				
At Designated Temperature	Rated	Max.	Nom.	Min.
Specific Gravity				
Vapor Pressure (psia)				
Viscosity (cp)				
Specific Heat (BTU/Lb.°F)				

Initial Boiling Point (°F) @ (psia)
Liquid µ Hazardous µ Flammable
µ Other
Corrosion / Erosion Caused by:
% Solid Max. Particle Size (in.)

PERFORMANCE

e Performance Curve No. ☒ Speed (rpm)

Measured at Capacity

	Rated	Max.	Normal	Min.
e NPSH Req'd (ft.)				
e Total Differential Head @ Rated Impeller (ft.)				
e Max. Differential Head @ Rated Impeller (ft.)				

e Minimum Continuous Flow
Thermal (gpm) Stable (gpm)
e Allowable Operating Region To (gpm)
e Best Efficiency Point for Rated Impeller (gpm)
e Suction Specific Speed
e Impeller Diameter Rated Max. Min. (In.)
e Pump Rated Power (bhp) e Efficiency (%)
e Maximum Power @ Rated Impeller (bhp)
e Rotation (Viewed from Coupling End) e CW e CCW

Case Pressure Rating
µ Max. Allowable Working Pressure (psig) @ (°F)
µ Hydrostatic Test Pressure (psig)

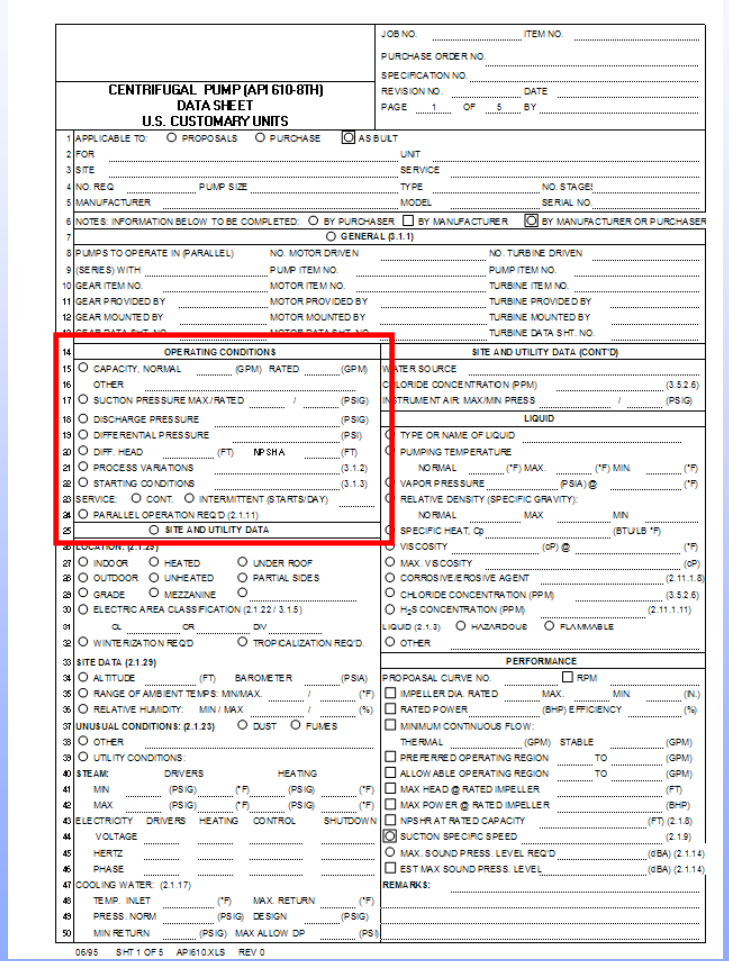
µ SITE CONDITIONS

Location µ Indoor µ Outdoor
Altitude (ft.)
Range of Ambient Temperatures Min./Max. / (°F)
Electrical Classification CL Gr. Div.
µ Non Hazardous

µ GENERAL REMARKS

REV	DATE	REASON FOR REVISION	BY	CHECK	APPROVED
4					
3					
2					
1					
0					

PIP (PIP RESP 73/ASME B73)



CENTRIFUGAL PUMP (API 610-8TH)
DATA SHEET
U.S. CUSTOMARY UNITS

JOB NO. ITEM NO.
PURCHASE ORDER NO.
SPECIFICATION NO.
REVISION NO. DATE
PAGE 1 OF 5 BY

APPLICABLE TO: O PROPOSALS O PURCHASE ☒ AS BUILT
FOR UNIT
SITE SERVICE
NO. REQ. PUMP SIZE TYPE NO. STAGES
MANUFACTURER MODEL SERIAL NO.
NOTES: INFORMATION BELOW TO BE COMPLETED: O BY PURCHASER ☐ BY MANUFACTURER ☒ BY MANUFACTURER OR PURCHASER

O GENERAL (3.1.1)

PUMPS TO OPERATE IN (PARALLEL) NO. MOTOR DRIVEN NO. TURBINE DRIVEN
(SERIES) WITH PUMP ITEM NO. PUMP ITEM NO.
GEAR ITEM NO. MOTOR ITEM NO. TURBINE ITEM NO.
GEAR PROVIDED BY MOTOR PROVIDED BY TURBINE PROVIDED BY
GEAR MOUNTED BY MOTOR MOUNTED BY TURBINE MOUNTED BY
GEAR DATA SHT. NO. MOTOR DATA SHT. NO. TURBINE DATA SHT. NO.

OPERATING CONDITIONS

O CAPACITY, NORMAL (GPM) RATED (GPM)
OTHER
O SUCTION PRESSURE MAX./RATED / (PSIG)
O DISCHARGE PRESSURE (PSIG)
O DIFFERENTIAL PRESSURE (PSI)
O DIFF. HEAD (FT) NPSHA (FT)
O PROCESS VARIATIONS (3.1.2)
O STARTING CONDITIONS (3.1.3)
SERVICE: O CONT. O INTERMITTENT (STARTS/DAY)
O PARALLEL OPERATION REQ'D (2.1.11)

O SITE AND UTILITY DATA

LOCATION: (2.1.29)
O INDOOR O HEATED O UNDER ROOF
O OUTDOOR O UNHEATED O PARTIAL SIDES
O GRADE O MEZZANINE O
O ELECTRIC AREA CLASSIFICATION (2.1.22 / 3.1.5)
CL GR DIV
O WINTERIZATION REQ'D O TROPICALIZATION REQ'D.

SITE DATA (2.1.29)
O ALTITUDE (FT) BAROMETER (PSIA)
O RANGE OF AMBIENT TEMPS: MIN/MAX. / (°F)
O RELATIVE HUMIDITY: MIN / MAX / (%)
UNUSUAL CONDITIONS: (2.1.23) O DUST O FUMES
O OTHER
O UTILITY CONDITIONS:

STEAM:	DRIVERS		HEATING	
MIN	(PSIG)	(°F)	(PSIG)	(°F)
MAX	(PSIG)	(°F)	(PSIG)	(°F)

ELECTRICITY	DRIVERS	HEATING	CONTROL	SHUTDOWN
VOLTAGE				
HERTZ				
PHASE				

COOLING WATER: (2.1.17)
TEMP. INLET (°F) MAX. RETURN (°F)
PRESS. NORM (PSIG) DESIGN (PSIG)
MIN RETURN (PSIG) MAX ALLOW DP (PSI)

SITE AND UTILITY DATA (CONT'D)

WATER SOURCE
CHLORIDE CONCENTRATION (PPM) (3.5.2.6)
INSTRUMENT AIR: MAX/MIN PRESS / (PSIG)

LIQUID

TYPE OR NAME OF LIQUID
PUMPING TEMPERATURE
NORMAL (°F) MAX. (°F) MIN. (°F)
VAPOR PRESSURE (PSIA) @ (°F)
RELATIVE DENSITY (SPECIFIC GRAVITY):
NORMAL MAX MIN
SPECIFIC HEAT, Cp (BTU/LB °F)
VISCOSITY (cP) @ (°F)
MAX. VISCOSITY (cP)
CORROSIVE/EROSIVE AGENT (2.11.1.8)
CHLORIDE CONCENTRATION (PPM) (3.5.2.6)
H_2S CONCENTRATION (PPM) (2.11.1.11)
LIQUID (2.1.3) O HAZARDOUS O FLAMMABLE
O OTHER

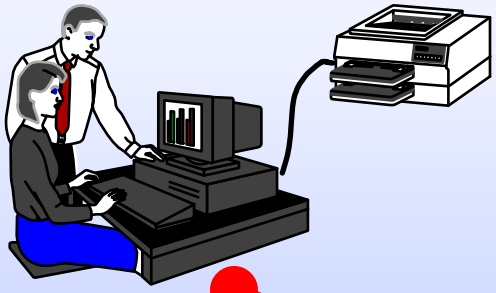
PERFORMANCE

PROPOSAL CURVE NO. ☐ RPM
☐ IMPELLER DIA. RATED MAX. MIN. (IN.)
☐ RATED POWER (BHP) EFFICIENCY (%)
☐ MINIMUM CONTINUOUS FLOW:
THERMAL (GPM) STABLE (GPM)
☐ PREFERRED OPERATING REGION TO (GPM)
☐ ALLOWABLE OPERATING REGION TO (GPM)
☐ MAX HEAD @ RATED IMPELLER (FT)
☐ MAX POWER @ RATED IMPELLER (BHP)
☐ NPSHR AT RATED CAPACITY (FT) (2.1.8)
☒ SUCTION SPECIFIC SPEED (2.1.9)
O MAX. SOUND PRESS. LEVEL REQ'D (dBA) (2.1.14)
☐ EST MAX SOUND PRESS. LEVEL (dBA) (2.1.14)
REMARKS:

06/95 SHT 1 OF 5 API610.XLS REV 0

API 610 Datasheet

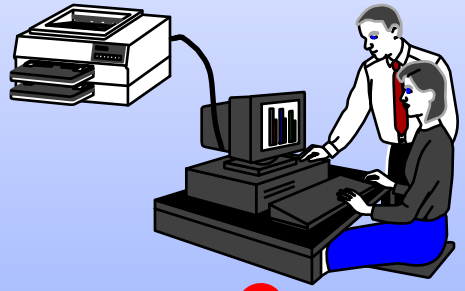
AEX / HI Transaction Dataset



What is the minimum information needed by the supplier to prepare a quality bid?
Required: Flow, Head, NPSHA, …
Desired: Applicable Standard, Materials, ..

Inquiry (BidRFQ)

Purchaser

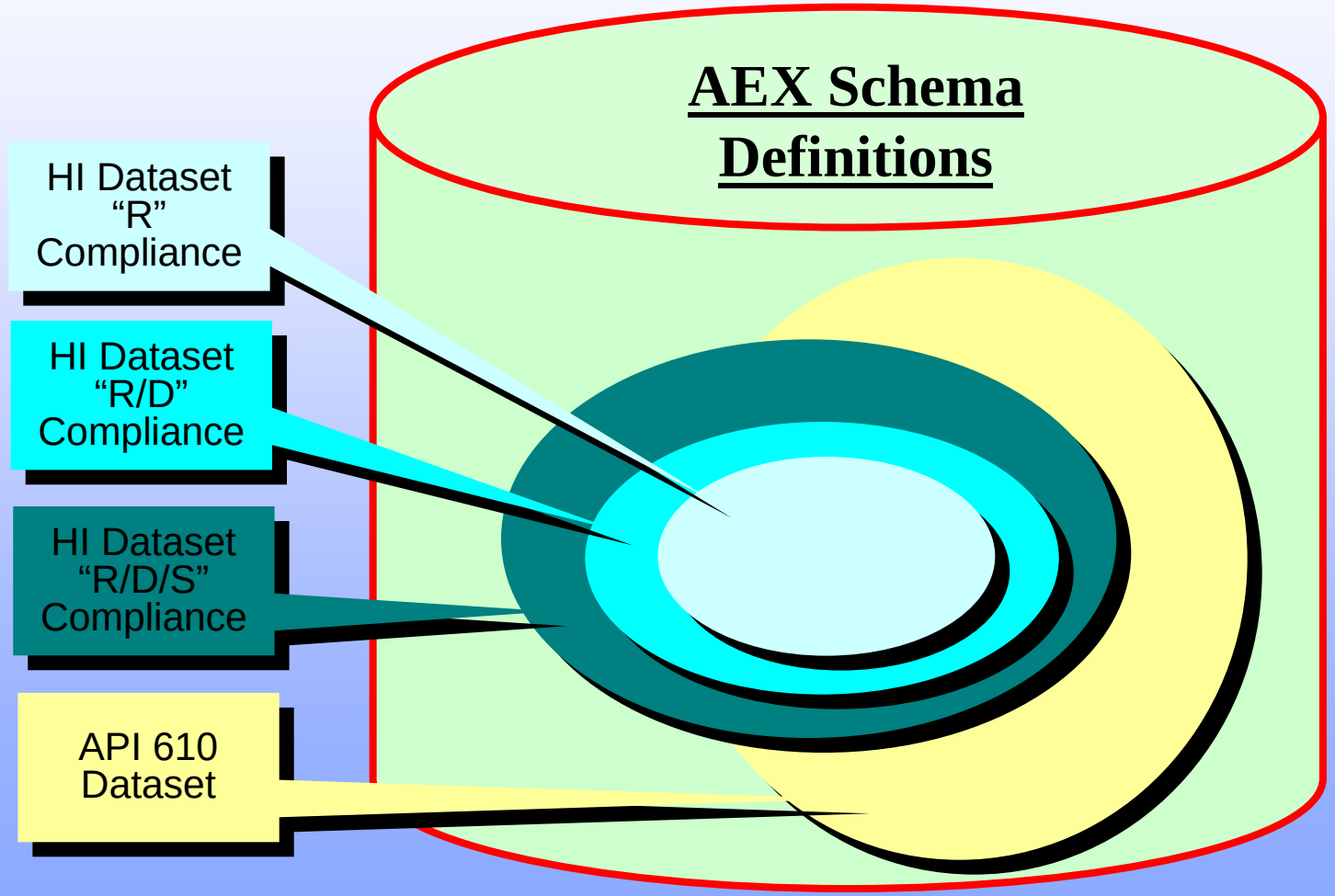


Bid (BidQuote)

Supplier

What is the minimum information needed by the purchaser to evaluate suppliers bids?
Required: Efficiency, Power, Pump type, …
Desired: Motor manufacturer, Nss, ..

EDE Transaction Compliance Levels



HI Compliance Level Summary

Summary of R / D / S / A Data Field Designations				
			Transaction Description	
Compliance Level	***Designation Letter***		***BidRFQ***	***BidQuote***
Required	R	*Process Definition*	Minimum Technical Information required by the pump supplier to provide a pump selection and technical scope-of-supply	Minimum Technical Information required by the pump purchaser to evaluate the pump performance basic technical scope-of supply for the pump item
		Typical Use	Inquiry for budgetary quotation	Response to budgetary quotation
Required / Desired	R/D	*Process Definition*	Typical Technical Information required by the pump supplier to provide a pump selection and technical scope-of-supply. All required data is needed and some/all of the desired information.	Typical Technical Information required by the pump purchaser to evaluate the pump performance and technical scope-of supply for the pump item. All required data is needed and some/all of the desired information.
		Typical Use	Request for quotation for an upcoming purchase.	Response to quotation for an upcoming purchase
Required / Desired/ Supplementary	R/D/S	*Process Definition*	Typical Technical Information required by the pump supplier to provide a pump selection and technical scope-of-supply. All required data needed and some/all of the desired plus supplementary information.	Typical Technical Information required by the pump purchaser to evaluate the pump performance technical scope-of supply for the pump item. All required data needed and some/all of the desired plus supplementary information.
		Typical Use	Request for quotation for an upcoming purchase or as-built construction	Response to quotation for an upcoming purchase or description of as-ordered or as-built construction.
API 610	R/D/S/A	*Process Definition*	Technical data needed in order to produce an API 610 datasheet. This data is in addition to the required plus desired plus supplementary data.	Technical data needed in order to produce an API 610 datasheet. This data is in addition to the required plus desired plus supplementary data.
		Typical Use	Request for quotation for an upcoming purchase or as-built construction for an API 610 Application	Response to quotation for an upcoming purchase or description of as-built construction for an API 610 application

HI Transaction Dataset

Pump Technologies

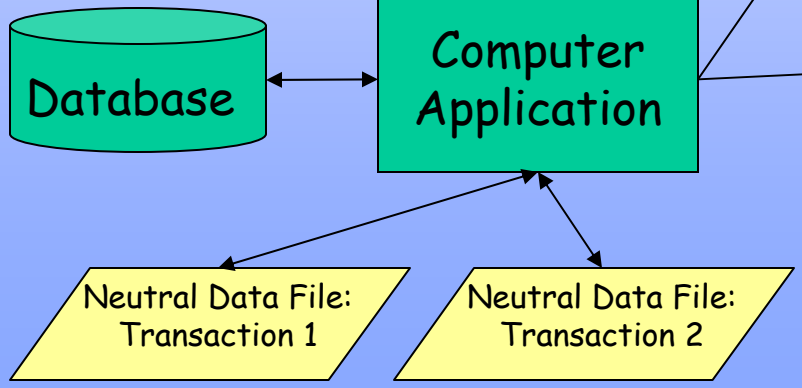
Data Item Definitions

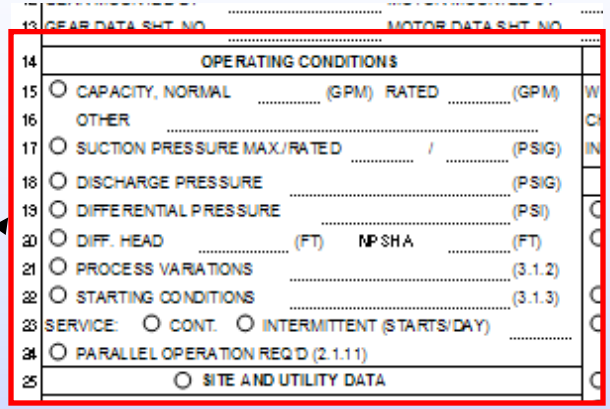
R/D/S Designations

Data Field Group Number	Data Field Group	Data Field Name	Applicable Pump Technology: Centrifugal	Applicable Pump Technology: Vertically Suspended	Applicable Pump Technology: Rotary	Data Field Definition	Data Item Compliance Designation: Centrifugal Bid RFQ	Centrifugal Bid Quote	Vertically Suspended Bid RFQ	Vertically Suspended Bid Quote	Rotary Bid RFQ	Rotary Bid Quote
3000	Operating Conditions	Continuous or intermittent operation Duty Cycle	Y	Y	Y	A statement of whether the pump will be operated continuously or will be cycled on/off within an operating day. A more detailed description of the duty cycle including number of hours of operation per day shall be described in the "Operating Conditions Re	R	R	R	S	D	S
		Differential Head, Maximum	Y	Y	N	The maximum algebraic difference in the same pressure units between the discharge and suction pressure . This is typically the difference between maximum discharge pressure and minimum suction pressure. Differential pressure is needed to specify positive	D	R	S	S	N/A	N/A
		Differential Head, Minimum	Y	Y	N	The minimum algebraic difference in the same pressure units between the discharge and suction pressure . This is typically the difference between minimum discharge pressure and maximum suction pressure. Differential pressure is needed to specify positive	D	D	S	S	N/A	N/A
		Differential Head, Normal	Y	Y	N	The total discharge head less the total suction head measured relative to any common horizontal datum plane. Total head is the static head plus the velocity head plus the vertical distance from the static head measurement instrument to the datum. This i	D	D	S	S	N/A	N/A
		Differential Head, Rated	Y	Y	N	The total discharge head less the total suction head measured relative to any common horizontal datum plane. Total head is the static head plus the velocity head plus the vertical distance from the static head measurement instrument to the datum. This i	R	R	R	R	N/A	N/A
		Differential Pressure Maximum	Y	Y	Y	The maximum algebraic difference in the same pressure units between the discharge and suction pressure . This is typically the difference between maximum discharge pressure and minimum suction pressure. Differential pressure is needed to specify positive	D	D	S	S	R	R
		Differential Pressure Minimum	Y	Y	Y	The minimum algebraic difference in the same pressure units between the discharge and suction pressure . This is typically the difference between minimum discharge pressure and maximum suction pressure. Differential pressure is needed to specify positive	D	D	S	S	D	D
		Differential Pressure Normal	Y	Y	Y	The algebraic difference in the same pressure units between the discharge and suction pressure at normal conditions. This is the normal differential pressure at which the pump is expected to operate for the majority of the time in service. It may or may	D	D	S	S	D	D
		Differential Pressure, Rated	Y	Y	Y	The algebraic difference in the same pressure units between the discharge and suction pressure. Rated conditions are specified by the purchaser. Differential pressure is needed to specify positive displacement pumps but not typically used for rotodynam	R	R	R	R	R	R

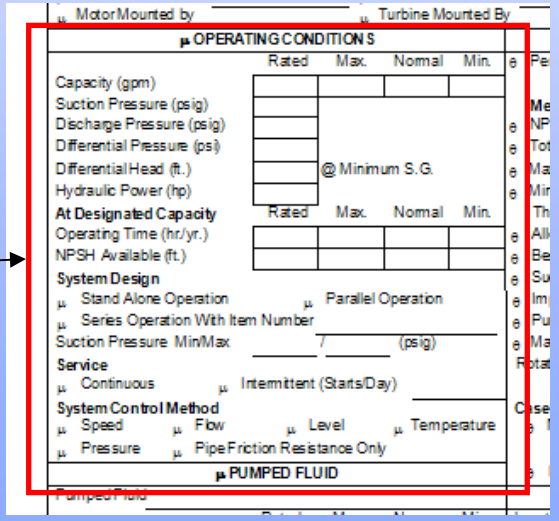
Neutral Data vs. Datasheet

- Benefits of Neutral Data
  - Same Neutral Dataset (in XML format) can produce many datasheets
  - Data can be “processed” quickly with many computer applications
  - Data can be stored and reused across applications and organizations.





API 610 Datasheet



PIP (PIP RESP 73/ASME B73)

Cooperation among HI/AEX, API and ANSI B73

API and ANSI B73 are focused on mechanical standards and datasheets – not *schemas*

- AEX provides a non-competing, non-proprietary data exchange specification
  - Available free to API and the industry
  - Developed with broad industry consensus
  - HI / AEX provide implementation and deployment guides
- AEX concept suitable for equipment types in following API standards:
  - API 610 / ISO 13709 – Centrifugal Pumps (*)
  - API 611, API 612/ISO 10437 – Steam Turbines
  - API 613 – Gear Units
  - API 616 – Gas Turbines
  - API 617 – Centrifugal Compressors
  - API 618 – Reciprocating Compressors
  - API 619 – Rotary Type Positive Displacement Compressors
  - API 673 – Centrifugal Fans
  - API 674 – Positive Displacement Pumps – Reciprocating (*)
  - API 675 – Positive Displacement Pumps – Controlled volume (*)
  - API 676 – Positive Displacement Pumps – Rotary (*)
  - API 682 – Pumps -- Shaft Sealing Systems (*)
  - API 685 – Sealless Centrifugal Pumps (*)
  - Etc.
- Hydraulic Institute supporting AEX in Pump Industry -- denoted by (*)

Reference HI/AEX EDE Standards as a companion to API Equipment Datasheet and B73 Datasheet