3D Scanning Services and Equipment

EXACT METROLOGY

Discharge Head Replacement Project

Energy Northwest
Columbia Station

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Exact Metrology

Energy Northwest Columbia Generating Station

EXACT METROLOGY

Inside a Nuclear Power Station

Fukushima Disaster

Job Scope

- After decades of service, a safety system discharge head needed replacement at the Columbia Nuclear Energy Station.
- A replacement head arrived on-site, but verification was needed to ensure the new head would match field conditions of the original head
- Columbia Station had a very short window in which to replace the head, there would be no time for misalignments in the field.
- Any dimensional documentation of the existing discharge head could not be verified for accuracy.
- Exact Metrology was brought in to provide 3-D models of the new and old head and provide comparison reports to alert Columbia Station of any potential problems that could arise during the replacement installation.

Metrology Equipment Utilized:
Leica Geosystems HDS7000 Laser Scanner

- Fully integrated Laser Scanner
- Onboard scanning
- Battery operated
- Up to 1,000,000 points/sec
- 180 Meter Range
- Accurate to +/-0.125”
- No warm-up time
- Phase Based Scanner
- Captures entire 3-D scene
- Class 1 Laser safety rating

Metrology Equipment Utilized:
Romer Absolute Si PCMM

- Fully integrated Laser Scanner and Probing
- Up to 50,000 points/sec
- Accurate to +/-0.0025”
- Wireless scanning
- Battery operated
- No warm-up time
- Available 2 M – 4.5 M
- Semi-automatic power/exposure
- No part coating necessary
- Automatic probe/scanner recognition

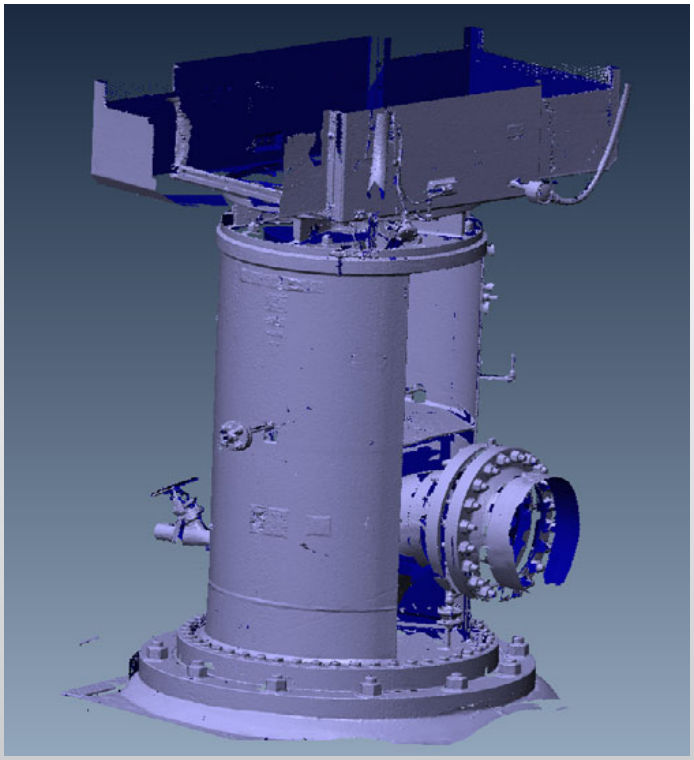
Existing Discharge Head

Existing Discharge Head

Replacement Discharge Head

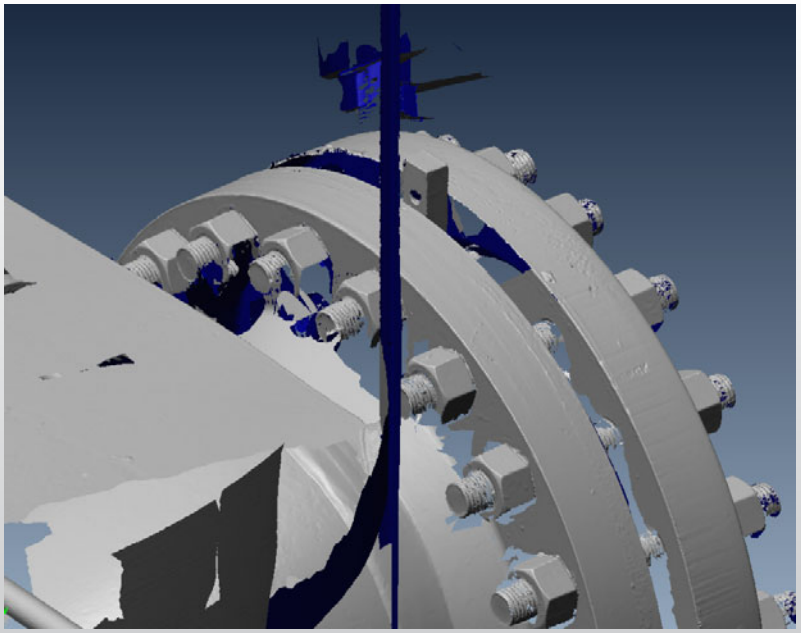
Stage 1 – Provide 3-D data of as-is condition of the existing discharge head

Coarse overall scan for clash detection



Data from Leica HDS7000

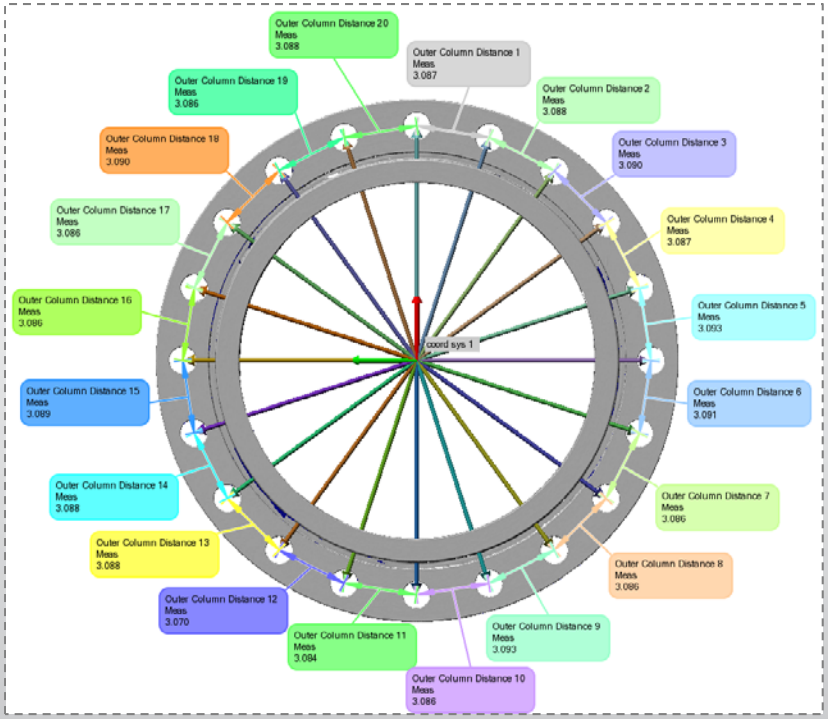
High Detail scans for alignment checks



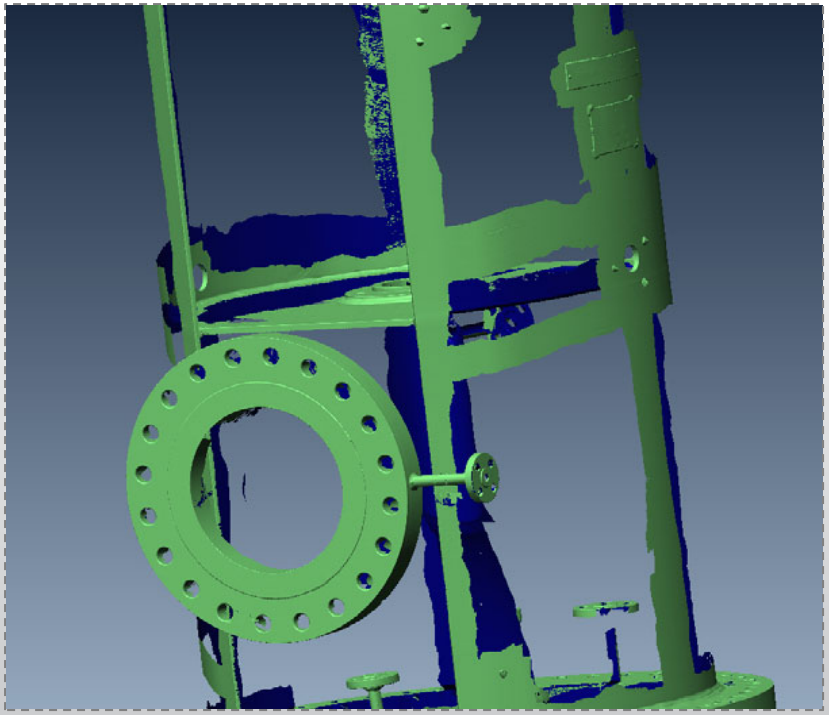
Data from Romer Si Scanner

Stage 2 – Provide 3-D data of as-built condition of the new discharge head

Dimensional detailing



High Detail scans for alignment checks



Stage 3 - Detailed reporting to compare & contrast all aspects of the fit-up

Detailed spreadsheet deviation reports

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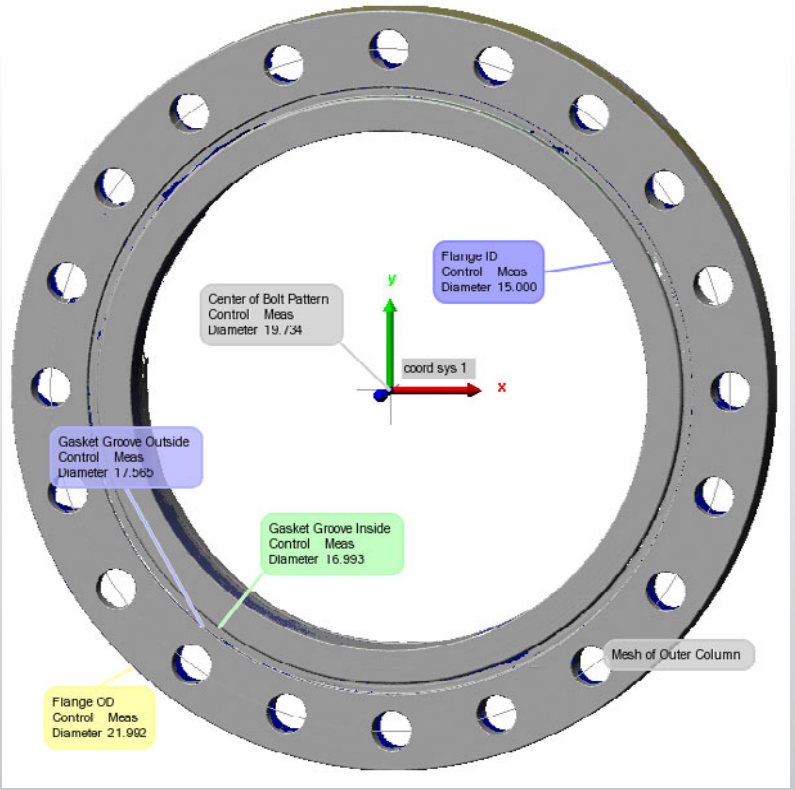
PH: 513-831-6620

Exact Metrology, Inc.
20515 Industry Avenue
Brookfield, WI 53045
PH: 262-533-0800

Discharge Flange & Motor Flange Actual Dimensions Sheet

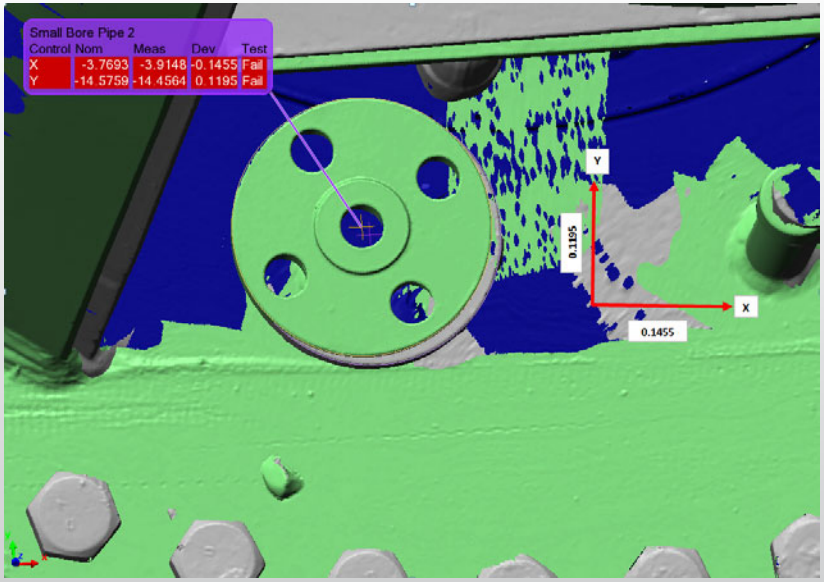
Name	Control	Existing Measured [Inch, Degree]	New Measured [Inch, Degree]	Deviation [Inch, Degree]
Measurement A-1	Distance	23.459"	23.145"	-0.314"
Measurement A-2	Distance	23.471"	23.157"	0.314"
Measurement A-3	Distance	23.439"	23.165"	-0.274"
Measurement A-4	Distance	23.400"	23.158"	-0.242"
Measurement B	Distance	23.791"	23.885"	0.094"
Discharge Flange Hole Pattern	Diameter	20.229"	20.249"	0.020"
Discharge Flange Angle 1	Angle	17.906"	18.007"	0.101"
Discharge Flange Angle 2	Angle	17.705"	18.001"	0.296"
Discharge Flange Angle 3	Angle	18.157"	17.994"	-0.162"
Discharge Flange Angle 4	Angle	17.852"	17.995"	0.143"
Discharge Flange Angle 5	Angle	18.289"	18.018"	-0.270"

Visual data reports

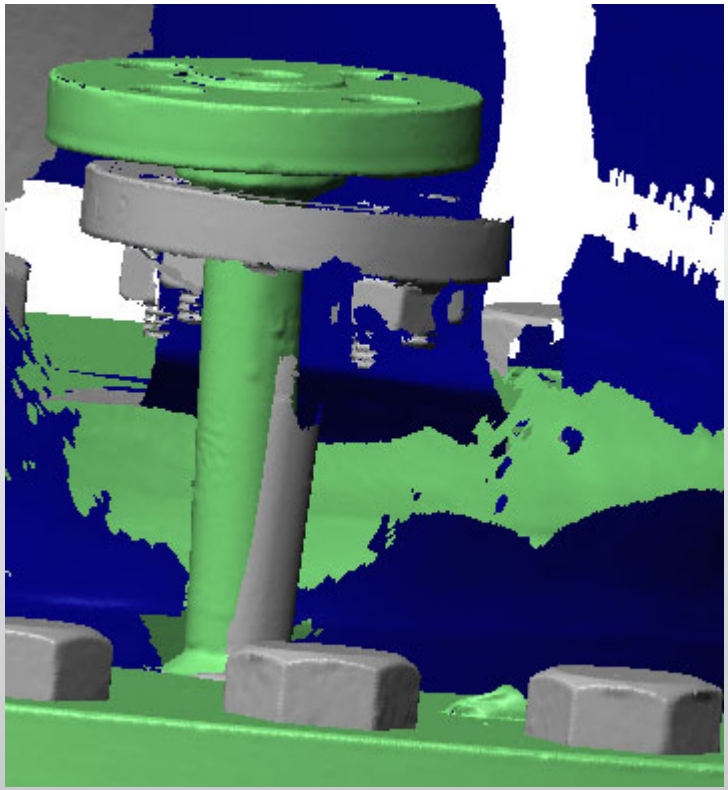


Stage 3 - Visual aid reporting providing predictive analysis of fit-ups

Mismatch on small bore piping

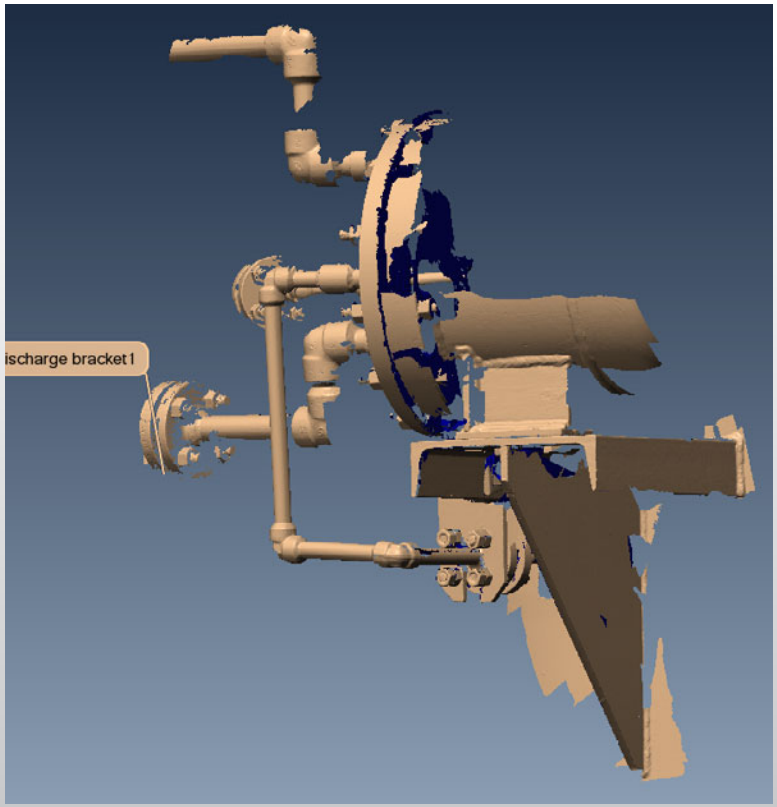


3-D Visualization of discrepancy

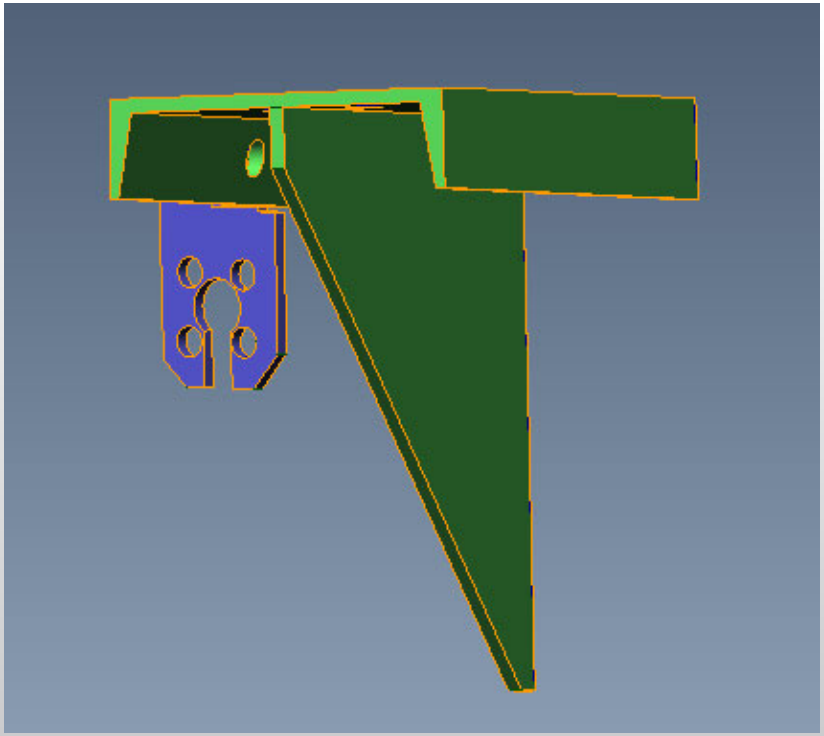


Stage 4: Reverse Engineering for fabrication of parts needing replacement

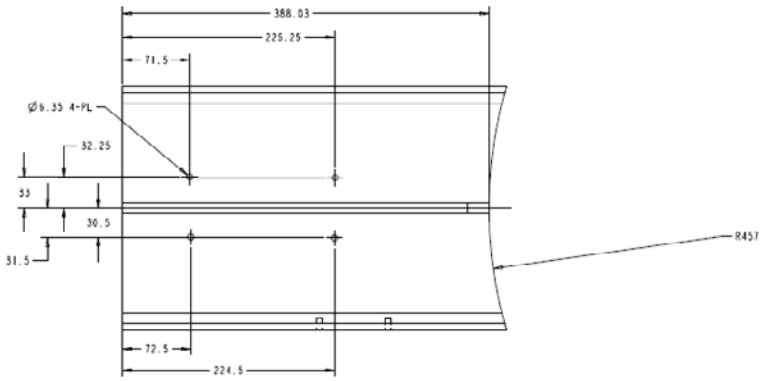
Scan data of bracket

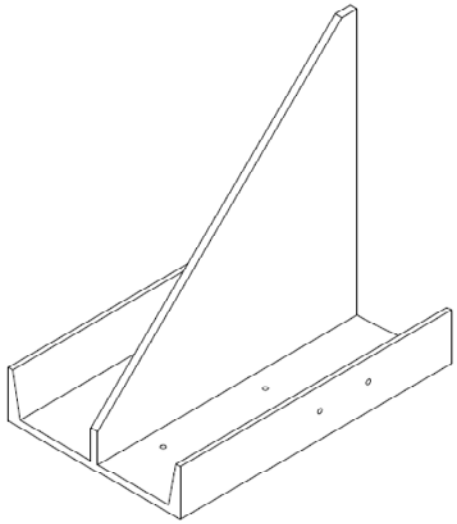


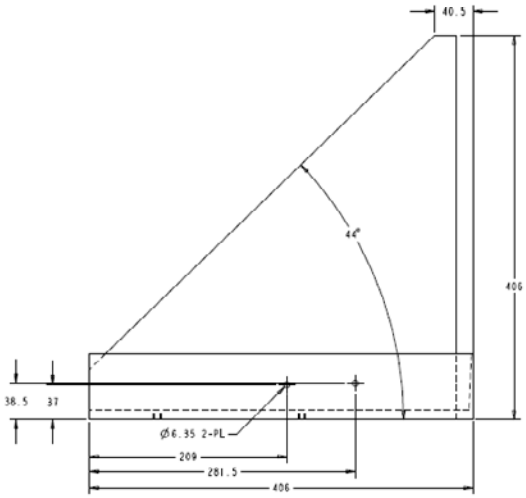
CAD model of reverse engineered bracket

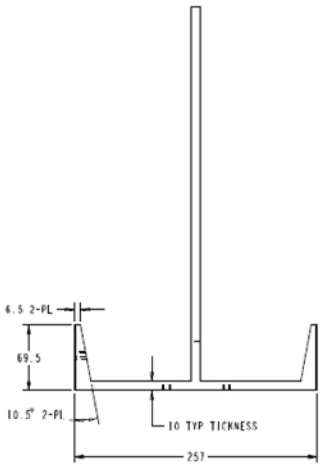


Stage 5: 2-D Fabrication drawing created from as-built scan data



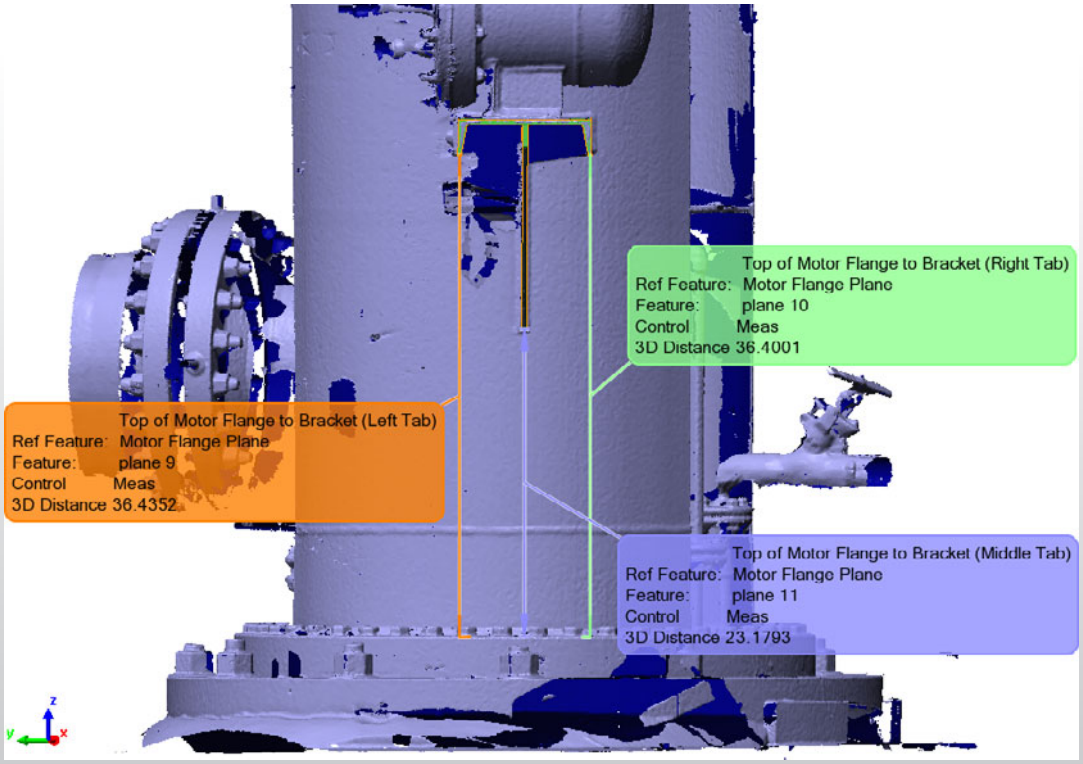






Stage 6: Reducing Installation time - providing a measurement map for field installers

To decrease downtime and dose during the outage, pre-fab dimensioning was provided for any add-on pieces. This allowed for many parts to be pre-fabricated before the outage, and provided exact dimensioning to the field crew when installation occurred.



Conclusion

- Provided as-built data of new and existing discharge heads
- Provided a comparison and virtual fit-up to predict areas of concern with hard data and visual representation
- Reduced install time by providing accurate/easy to use dimensions for field crews
- Reverse Engineered add-on parts
- Provided 2-D drawings for fabricators of add-on parts
- Provided overall predictive maintenance and eliminated any fit-up problems
- Decreased down-time and reduced dose
- All from one visit and one data set