

Dust Suppression Hopper Installation

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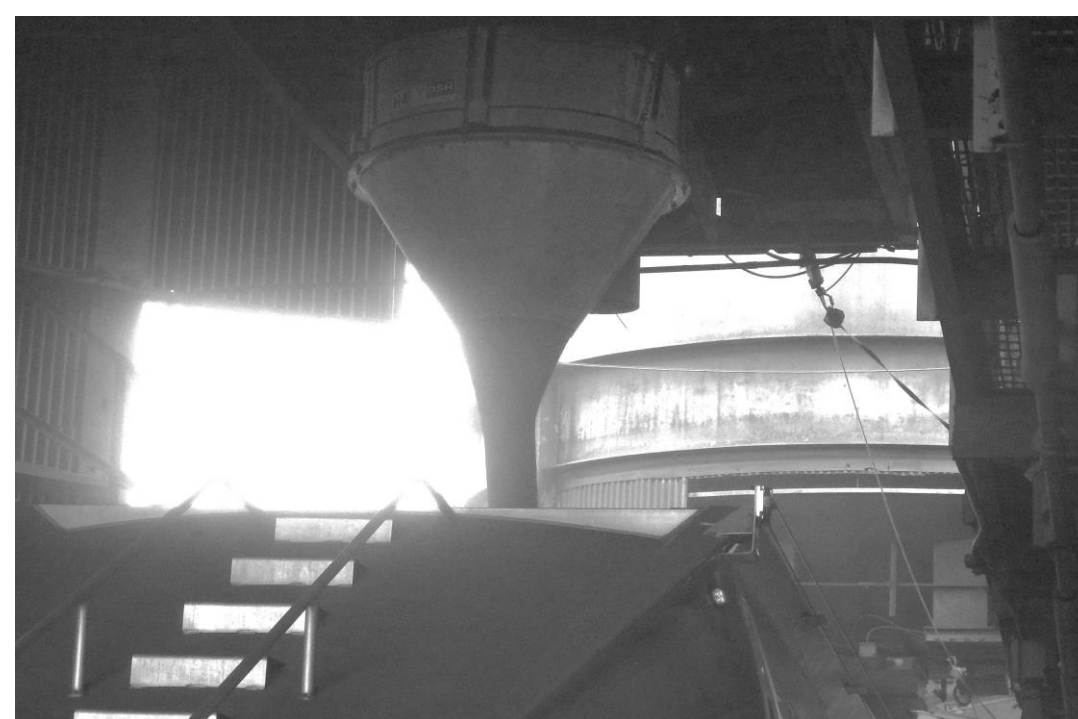


Background

- Oxbow Calcining processes and loads petroleum coke into trucks from an overhead silo
- During loading, substantial fugitive dust was emitted



Loading with Old System



Loading with New DSH System

Objectives

- Install a Dust Suppression Hopper (DSH) to reduce fugitive dust
- Collaborate with Sioux Steel to have a DSH with a replaceable funnel designed
- Provide a loading rate within 100 tons/hour of old system
- Design a support to mount beneath silo to support DSH
- Design overfill chute to be attached to bottom of DSH and locate manufacturer

Engineering Specifications

- Dust emission reduction: 20%
- Loading rate: 384 - 484 tons/hour
- Vertical clearance for DSH and support: 5 ft
- Max coke temperature: 300°F
- Support capacity: 2,500 lbf
- Max system weight: 10,000 lbf
- Budget: \$100,000

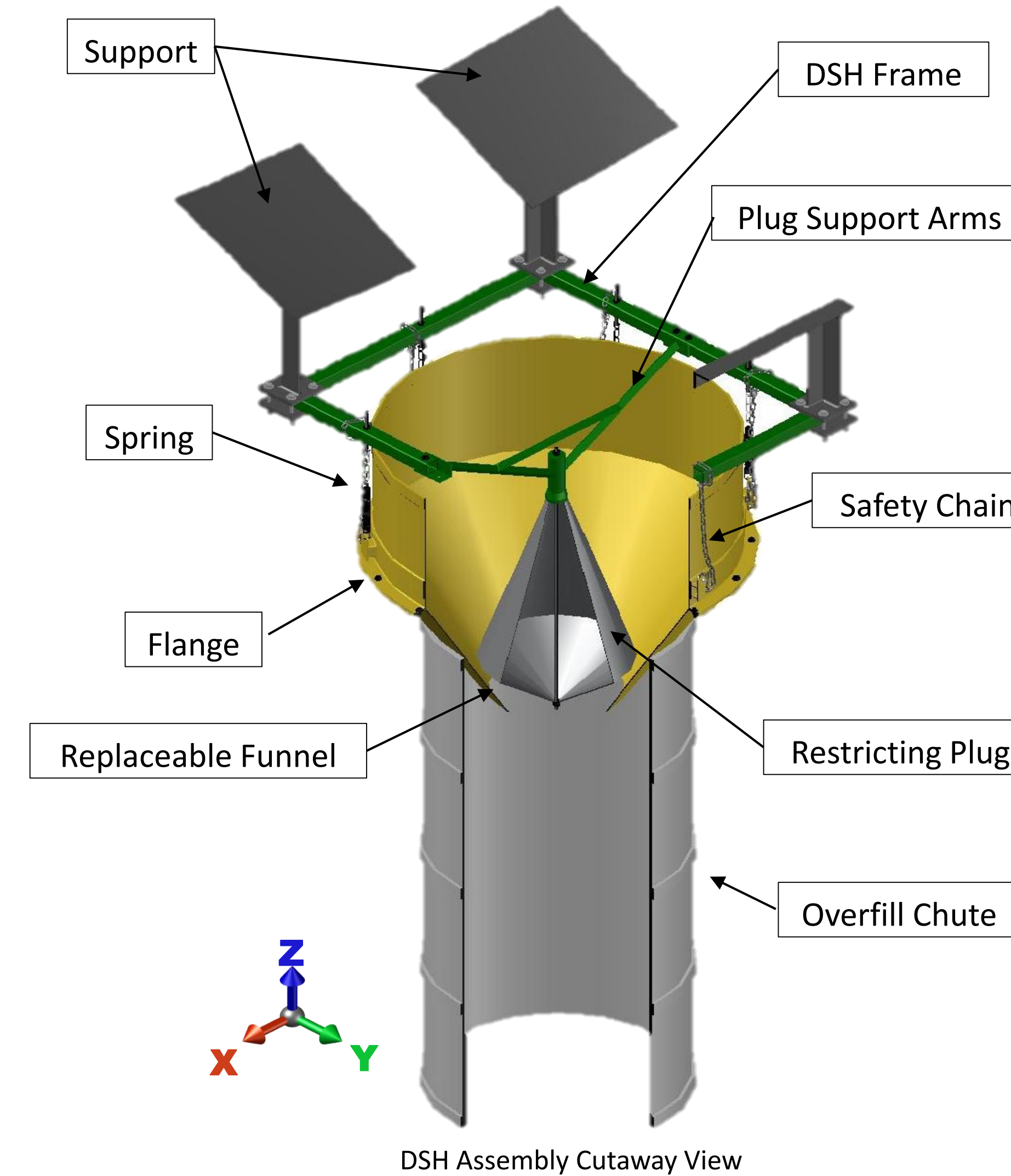
Materials/Manufacturing

Part	Material	Company
DSH	500 Hardox Steel	Sioux Steel
Support	ASTM A36 Steel	CCC Group
Overfill Chute	1050 Denier Nylon	Kimkits

Dust Suppression Hopper (DSH)

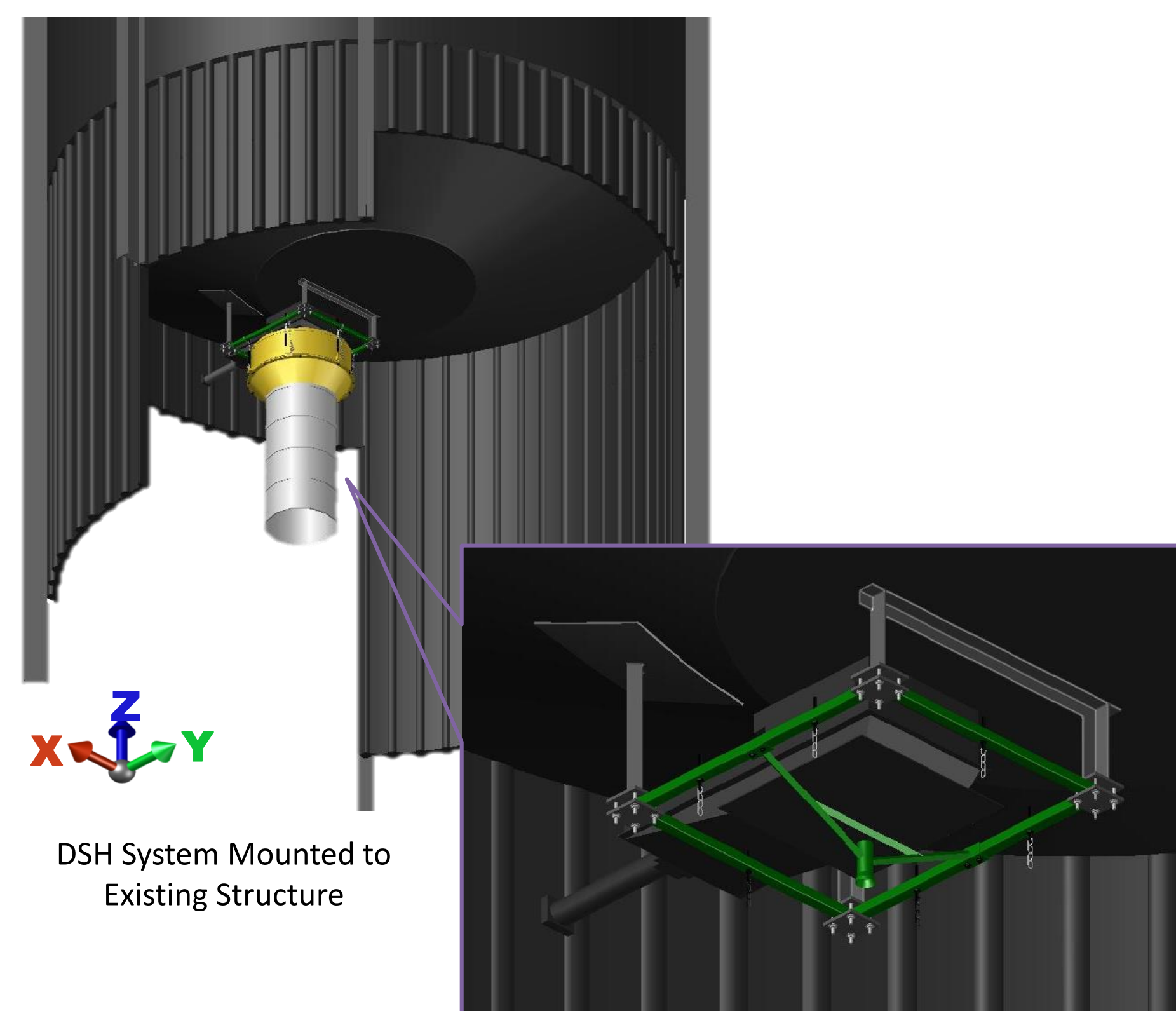


DSH Installed at Oxbow



DSH Assembly Cutaway View

Support Design

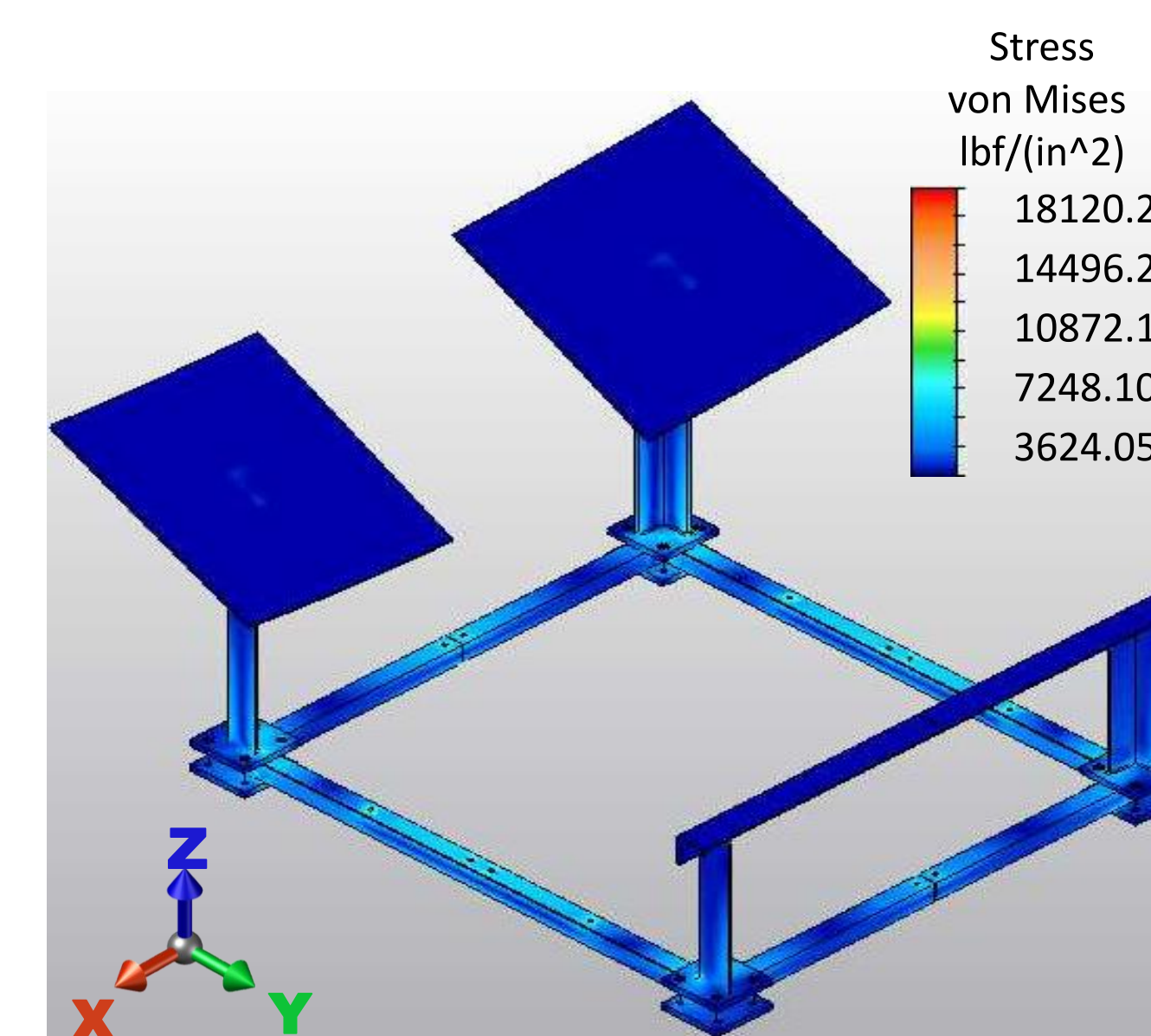


DSH System Mounted to Existing Structure

Enlarged View of Support and Frame

- Support consists of four vertical angle members (silver) bolted to the DSH frame (green) and welded to the existing silo (black)

Analysis



Stress Results from FEA

- The stress results from the Autodesk Simulation Mechanical Finite Element Analysis program (FEA) of the support structure show a max stress of 18.1 ksi occurring at the corner of the DSH Frame
- The displacement results from the FEA of the support design show a max displacement of 0.035 in
- ASTM A36 steel has a yield stress of 36 ksi, so these results are valid

Testing

- Visual testing showed an obvious reduction in dust
- Mass-based emission test showed a 40% reduction in dust
- Flow rate test proved that the rate was maintained

	Old System	New DSH System
Flow Rate (tons/hour)	484	425
Dust Emission Sample (ounces)	0.15	0.09

Safety

- Wear PPE on site: hard hat, orange vest, steel toes, and safety glasses (OSHA 1910.132)
- For welding, follow fire code: NFPA 654 and OSHA 1910.252
- For work at heights, use fall protection (OSHA 1926.501)
- For operational safety, use manufacturer's safety chains

Project Management

Milestones

- 1/13/2015 – Received DSH
- 2/19/2015 – Completed DSH installation
- 3/26/2015 – Received overfill chute
- 4/14/2015 – Completed chute installation

Project Budget

Project Budget	
Starting Budget	\$100,000.00
Modeling and Imaging	\$110.00
Dust Suppression Hopper	\$40,388.00
Construction Cost	\$46,000.00
Overfill Chute	\$1,100.00
Total Cost	\$87,598.00
Remaining Budget	\$12,402.00

Conclusion

- Met our objective of reducing dust emission by 20% with an actual reduction of 40%
- Met our objective of maintaining a loading rate within 100 tons/hour of the old system with an actual rate of 425 tons/hour
- Oxbow will have the loading chute repaired and reinstalled in late May as it was damaged by a truck