



Mechanical and Electrical Engineering Services

Liffttech

STS Crane Procurement



Needs Assessment
Specifications
Bid Packages
Bid Evaluations
Design Review

Manufacturing Review
Commissioning
Testing
Acceptance
Warranty

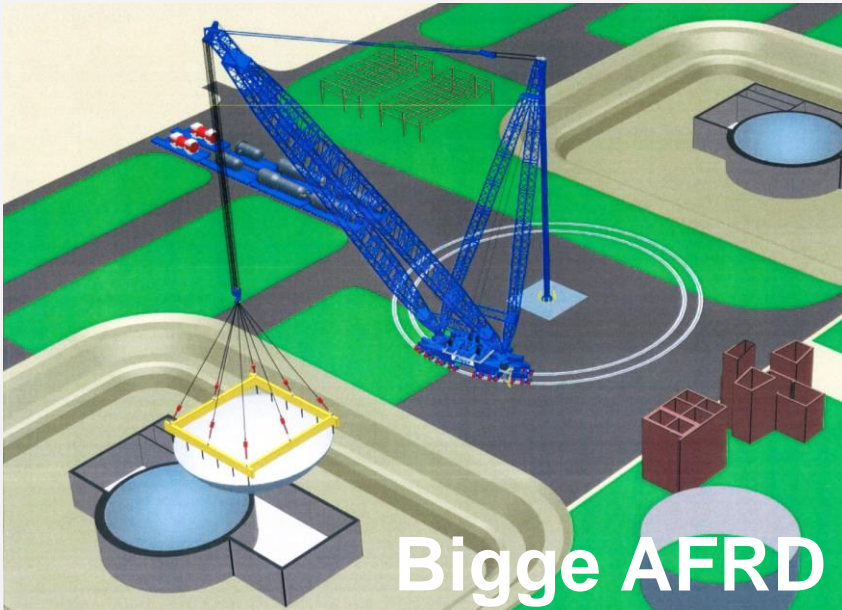
Other Container Cranes



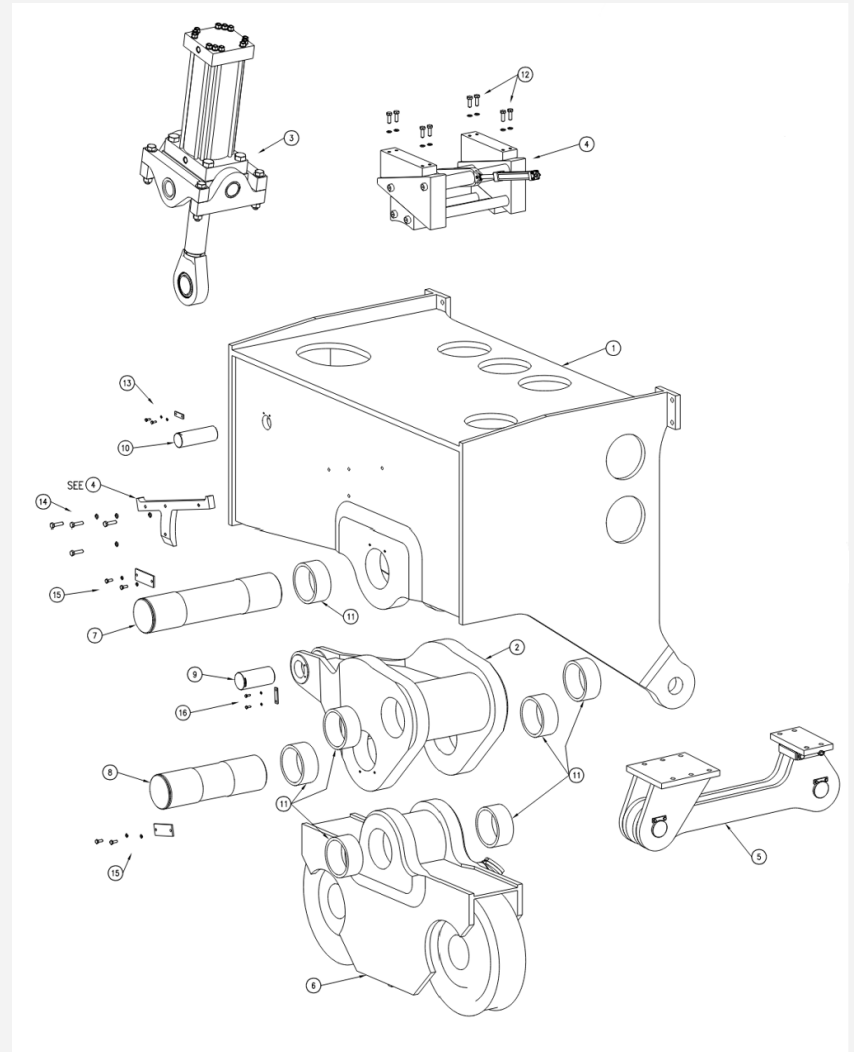
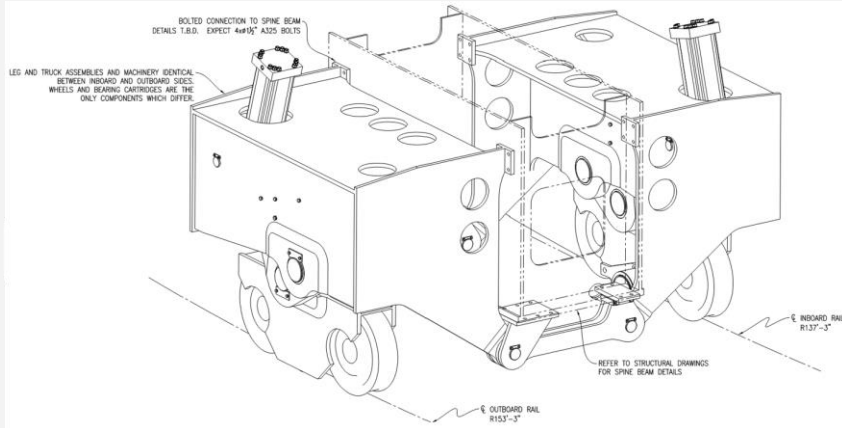
RTG
RMG
ASC

IYC
MHC

Specialty Cranes



Bigge AFRD



Floating Cranes



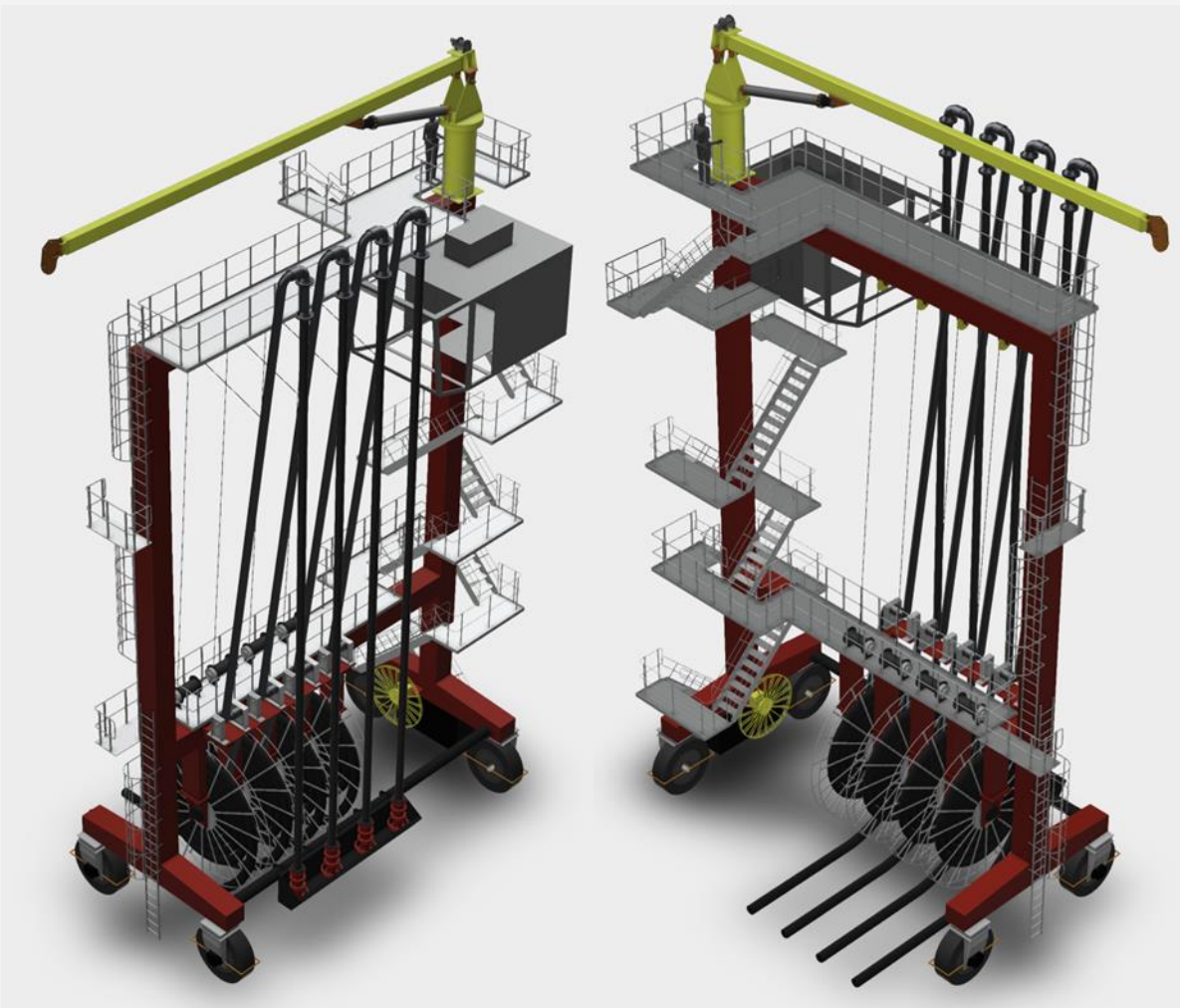
Left Coast Lifter

Dry Bulk Handling Equipment



Grab Bucket, Loaders, Unloaders, Stacker/Reclaimers

Liquid Bulk Equipment



**Hose
Towers**

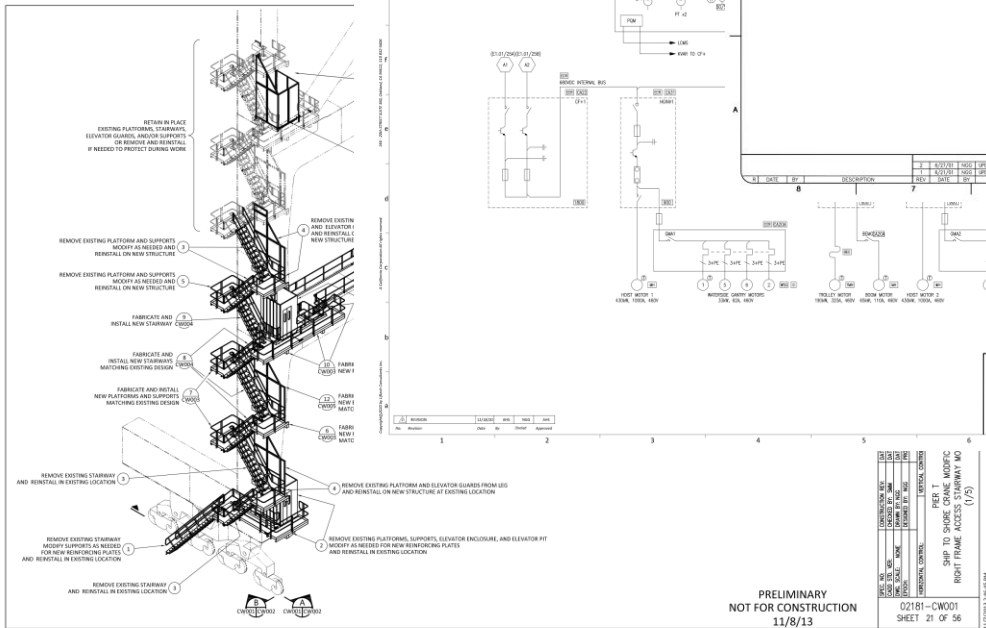
**Mobile
Equipment**

**Handling
Cranes**

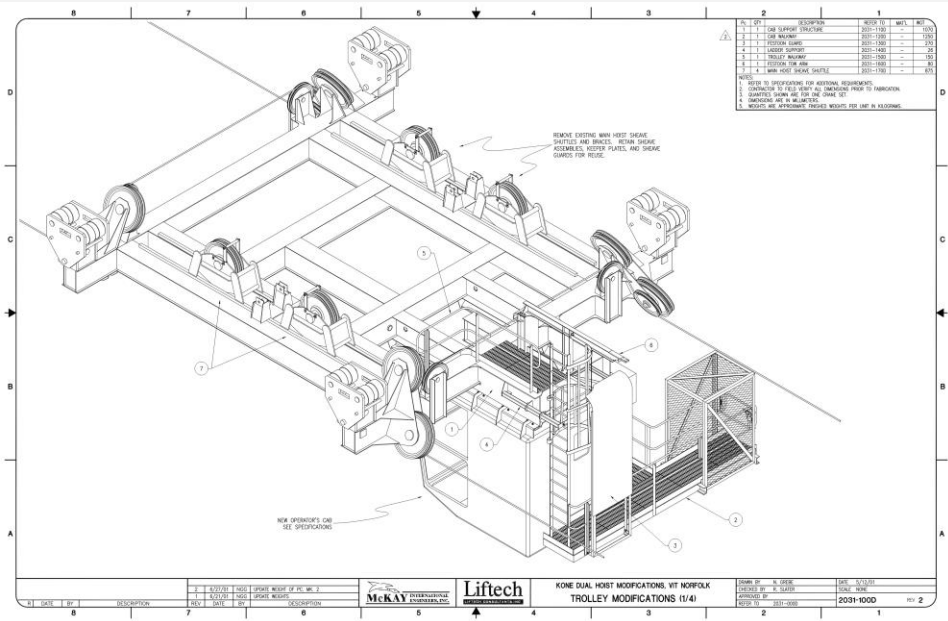
**POL and
MOTEMS**

Equipment Modifications

Raise and Extend Modernization Upstate



PROJECT: 02181-1018 Rev T Crane Raising/Modify Project Drawing(s) Drawing(s) 11/8/13: CW001 Right Frame Access 1 of 5 Draw
45259 0



PRELIMINARY NOT FOR CONSTRUCTION

Liftech CONSULTANTS INC.

MODIFICATION OF EXISTING LOW-PROFILE CRANES AT SOUTHWEST TERMINAL ONE-LINE DIAGRAM (1-7)

DATE: 11/8/13
BY: RER-T
CHECKED: RER-T
APPROVED: RER-T

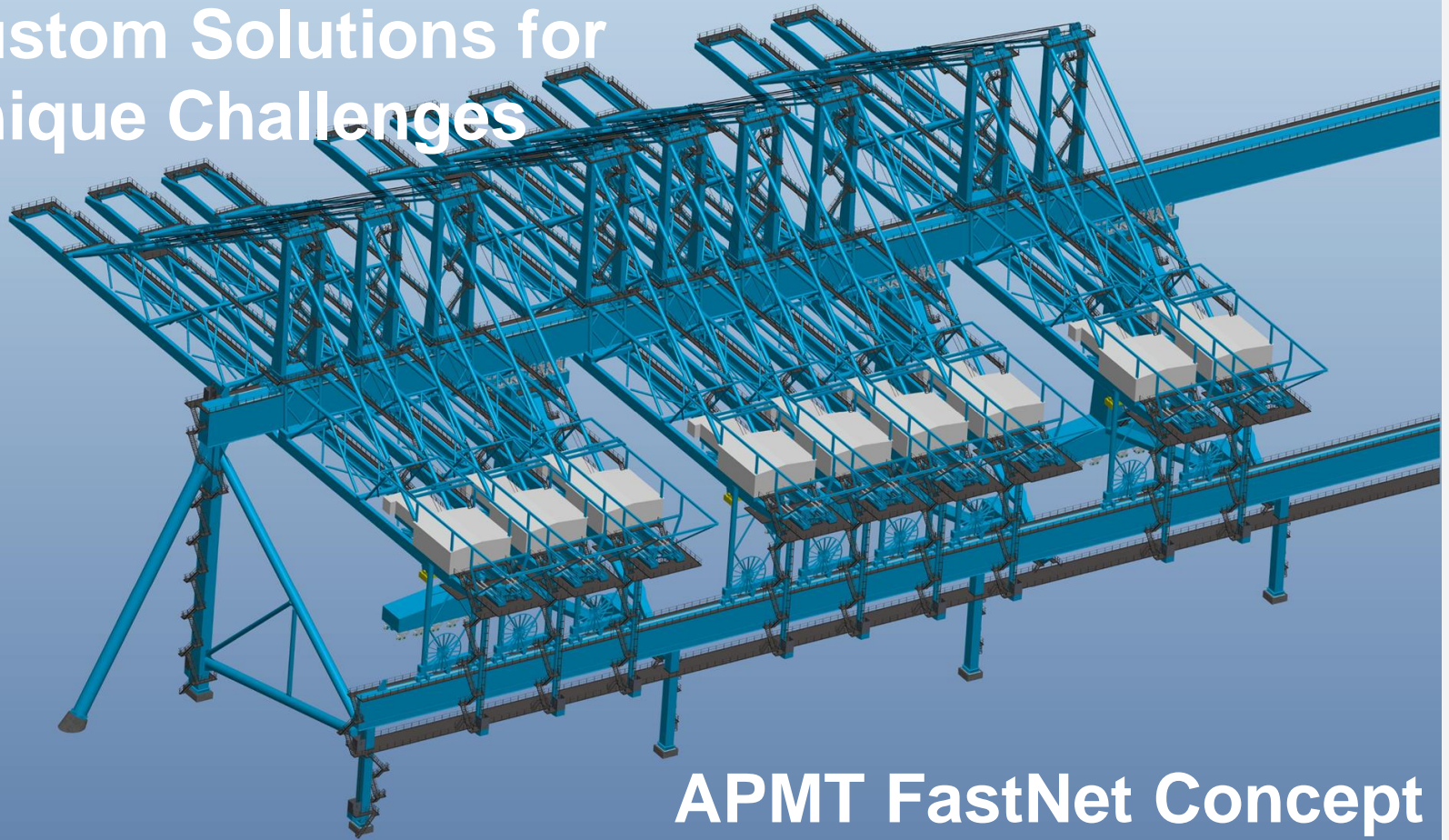
McKAY INTERNATIONAL

DC to AC Drive and Control Upgrades

Liftech
LIFTECH CONSULTANTS INC.

Concept Development & Design

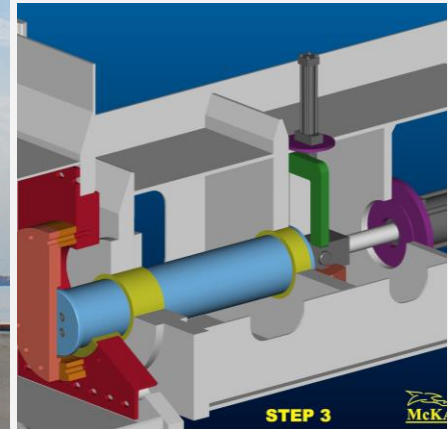
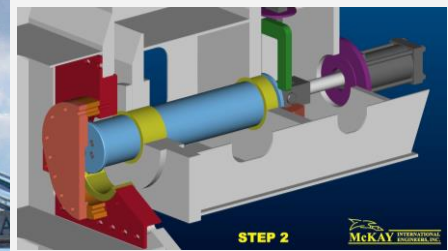
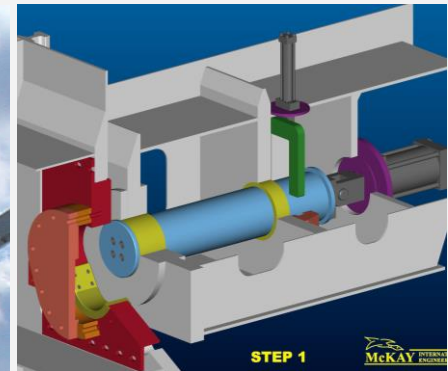
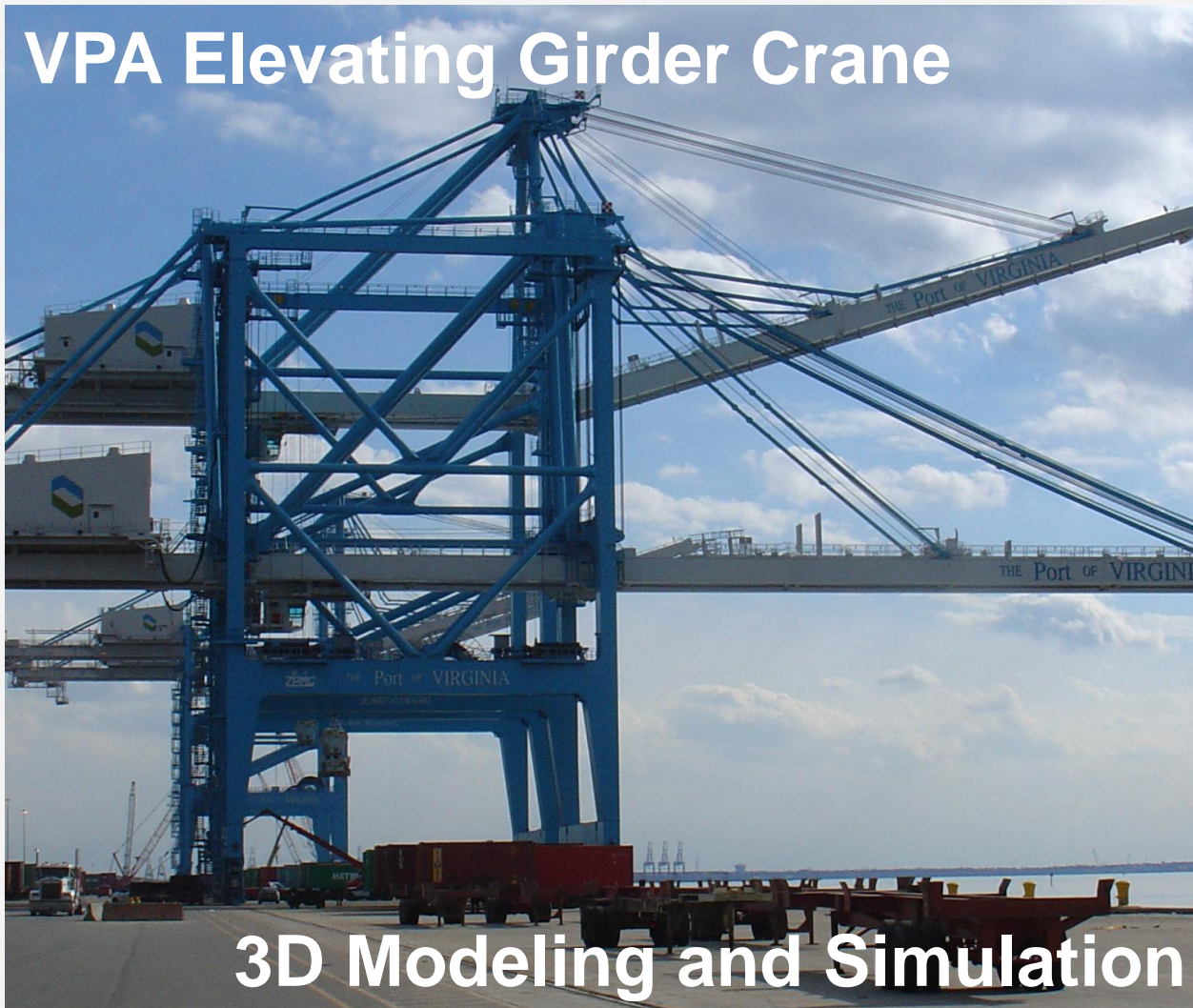
Custom Solutions for
Unique Challenges



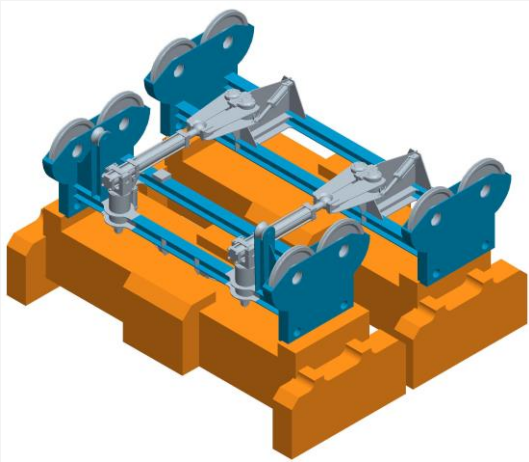
APMT FastNet Concept

Concept Development & Design

VPA Elevating Girder Crane

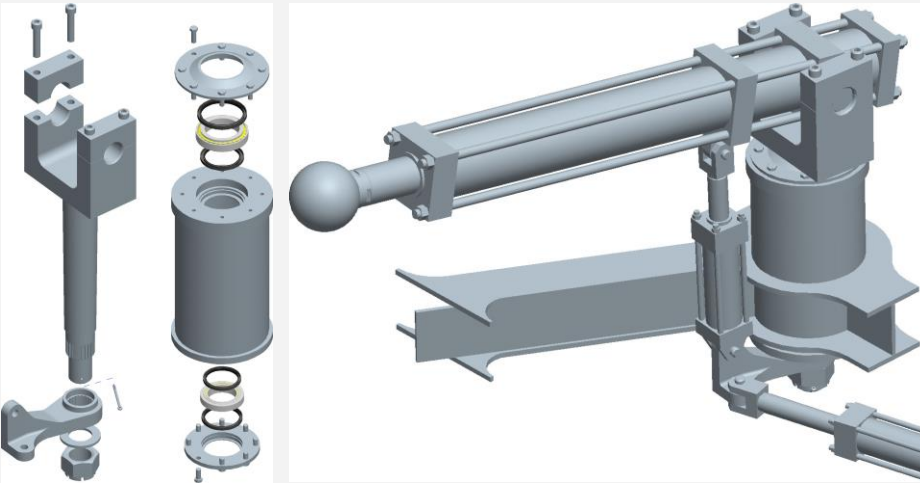


Concept Development & Design



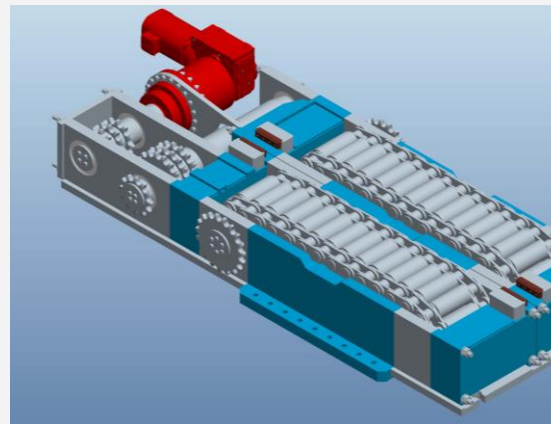
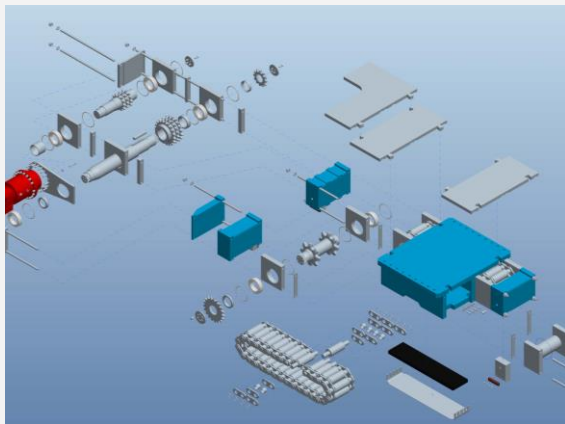
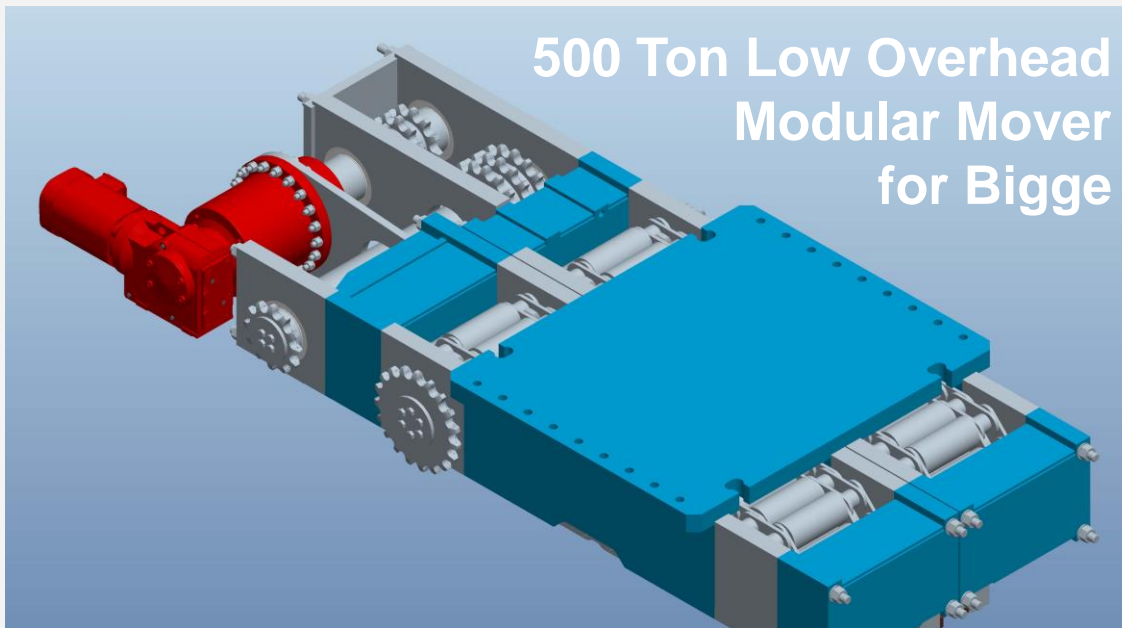
**Design
Improvement**

**Concept
Validation**



YICT DHT40

Specialty Equipment



**Rugged
Designs**

**Proven
Components**

3D Models

Detailed Parts

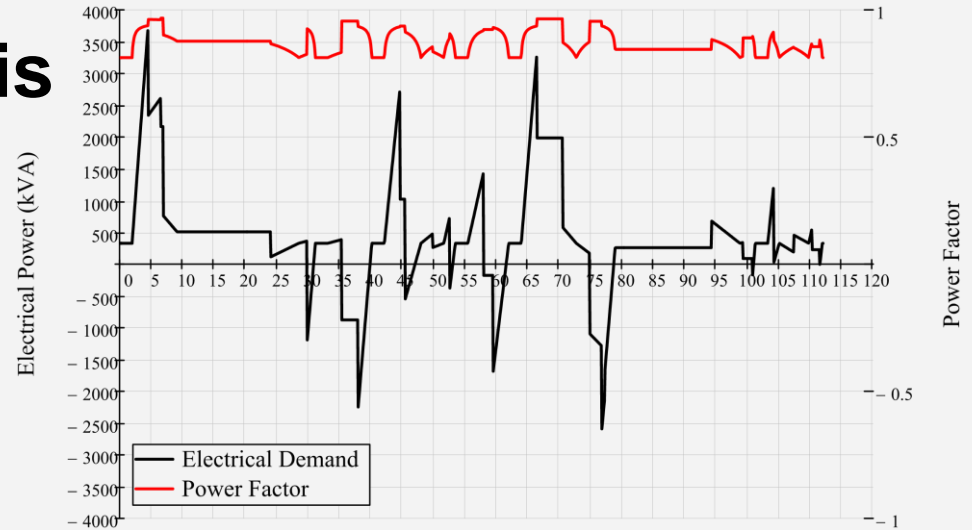
**Assembly &
Maintenance
Instructions**

Electrical Infrastructure

Power Demand Studies

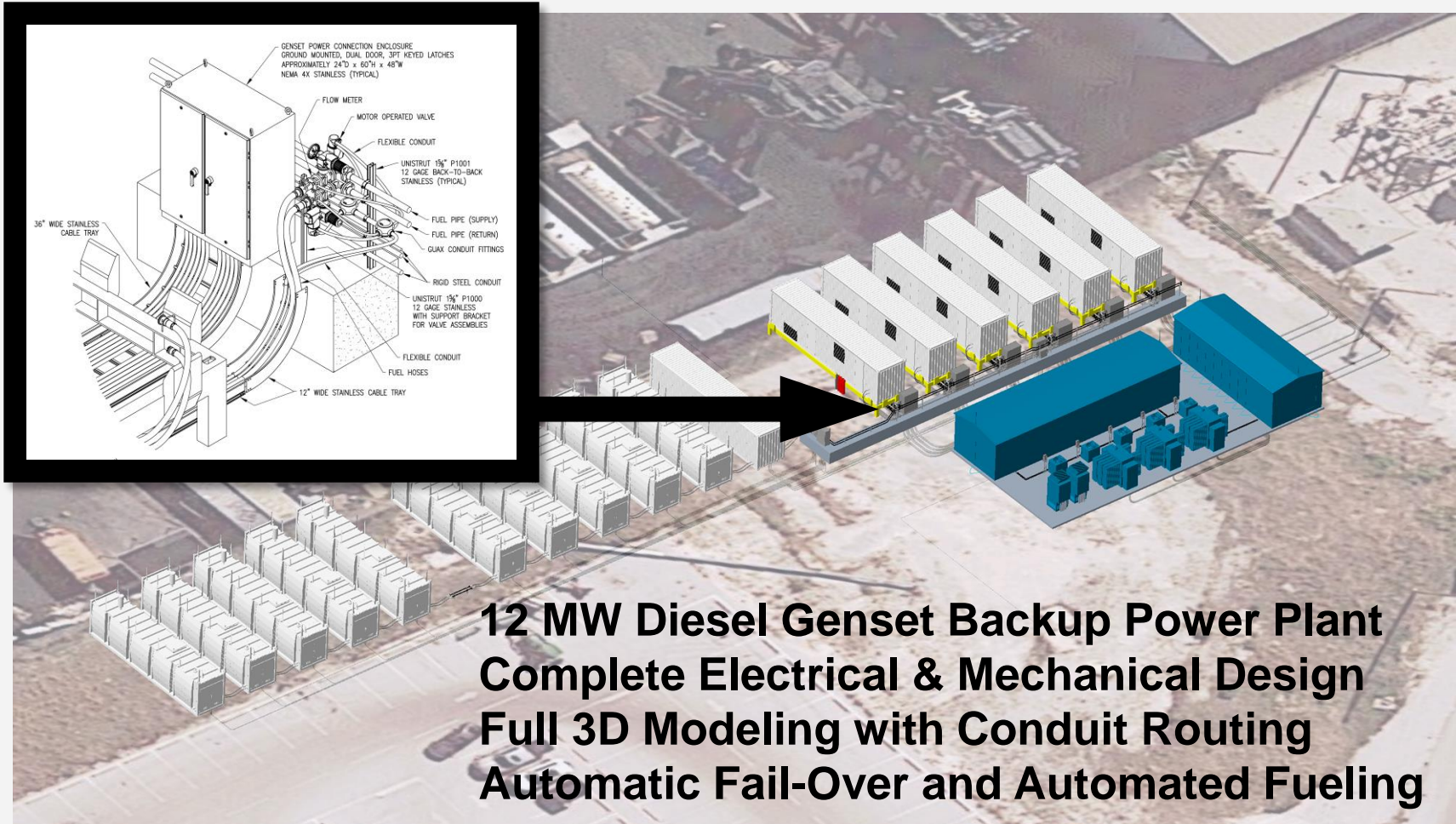
Voltage Drop Analysis

Network Analysis



Regenerative Power Handling
Circuit Protection Coordination
Switchgear and Transformers
Electrical Noise Mitigation

Electrical Power Systems



**12 MW Diesel Genset Backup Power Plant
Complete Electrical & Mechanical Design
Full 3D Modeling with Conduit Routing
Automatic Fail-Over and Automated Fueling**

Emission Reduction Conversions

Zero Emission Studies

Power Demand Modeling

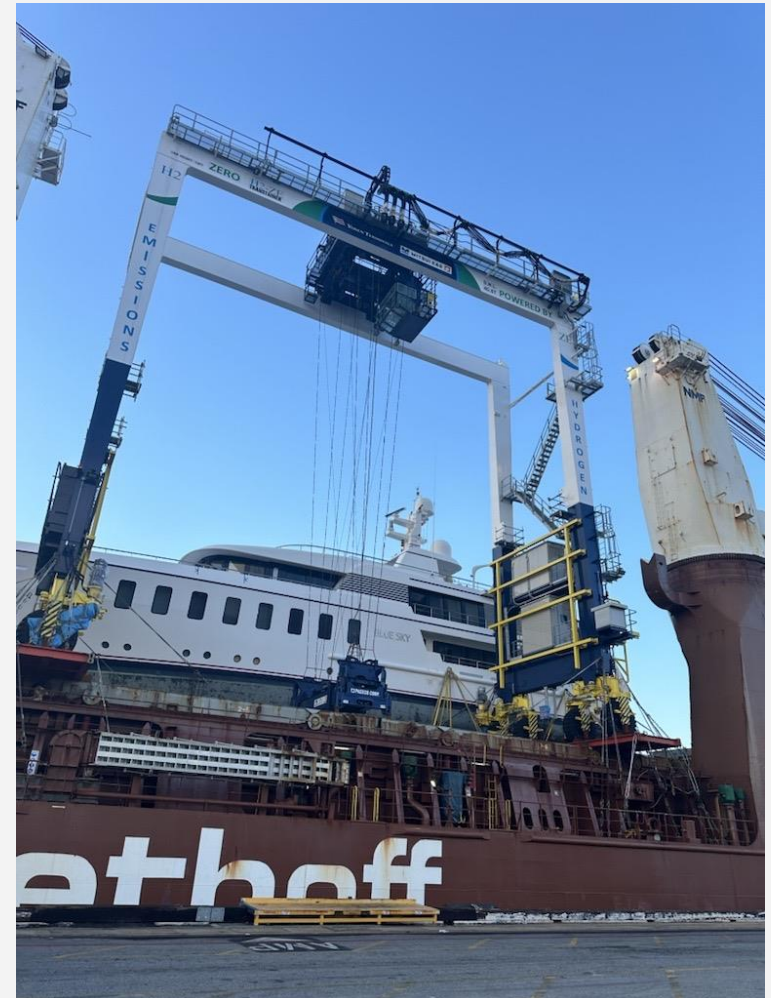
Diesel Hybrid Conversions

Battery Electric Systems

Charging Systems

H₂ Fuel Cells & Storage

Alternatives Investigation



Failure Analysis

1 PARAMETERS

1.1 COORDINATE SYSTEM
 +X Direction, Trolley Toward Water
 +Y Direction, Gantry to Operator's Left
 +Z Direction, Hoist Upward

1.2 PERFORMANCE PARAMETERS
 Number of hours of mechanical components $L_{mech} := 25000\text{hr}$
 Number of moves per hour (double move duty cycle) $f_{moves} := 60 \div \text{hr}$
 Number of cycles required $NA := L_{mech} \cdot f_{moves}$ REF: Spec Table 3.1 $NA = 1500000$

1.3 HEADBLOCK PARAMETERS
 Longitudinal distance between twistlocks $a := 5436\text{mm}$ REF: As Built
 Lateral distance between twistlocks $b := 762\text{mm}$ REF: As Built
 Weight of headblock $HB := 6547\text{kg}$ REF: As Built $HB = 6.5\text{t}$
 Headblock micro motion (x,y) $E_{HB}^T := (0 \ 6)^T$ in REF: Spec 3.9.17 $E_{HB}^T = (0 \ 152.4)$ mm

1.4 LOAD PARAMETERS
 Lateral loading (LATT) and wind loading (WLO) are ignored, as their effects on the load of the twistlock are small.

Mechanism	Examples in Load Path	FEM Cases I & II	FEM Case III	Overload	Fatigue	FEM Classification
Headblock	Sheave Pin, Spreader Connections & Twistlocks	LS + LLE + LATT + WLO	STL	STL	LS + LL + LATT + 50% WLO	3B

Table 3-2: Mechanical Load Combinations

Lifting system	$LS := 37500\text{lb} - HB$	REF: Spec 1.6.16	$LS = 10.5\text{t}$
Lifted load	$LL := 50\text{LT}$	REF: Spec 1.6.13	$LL = 50.8\text{t}$
Eccentric lifted load, 40ft	$LLE_{40} := 40\text{LT}$	REF: Spec 1.6.14	$LLE_{40} = 40.6\text{t}$
Eccentric lifted load, twin 20ft	$LLE_{20} := 25\text{LT}$	REF: Spec 1.6.14	$LLE_{20} = 25.4\text{t}$

2.2.2 Twistlock Calculation R3.mcd Printed: 8/18/2008 4:13 PM

REF: Spec 1.6.14 $E_{40}^T = (229 \ 1219)$ mm
 REF: Spec 1.6.30 $E_{20}^T = (229 \ 610)$ mm
 $8.005 \frac{2}{1155.6\text{mm}} - 8$ $STL = 120.4\text{t}$
 $1.6.29$ and the motor torque per lead line, taken from drum, multiplied by 8 lines at the headblock pins
 PPMC SUB NO: Vcal09 SV = 160t
 KG #42 "Calculation for Snag Device"
 F.E.M. T.2.1.4.1.2., 1500000 cycles = Class B7
 T.2.1.4.4., Spectrum class = Class P2
 From E6 above
 World Guide to Equivalent Weir Steels* 4th ed. Page China - 42CrMo*
 Sample Twistlock
 Machinery's Handbook 27th Ed. 8 & 1789 Fig. 3
 Peterson. Stress Concentration Factors. $k_{tB} = 2.7$ 5.6 "Bolt and Nut."
 REF: Solid Model, Appendix A
 REF: Solid Model, Appendix A
 REF: Solid Model, Appendix A $LF_C := 41.2\text{mm}$

FEM Case III, Snag	Overload	Fatigue
[kN]	[kN]	[kN]
392.3	295.2	158.6

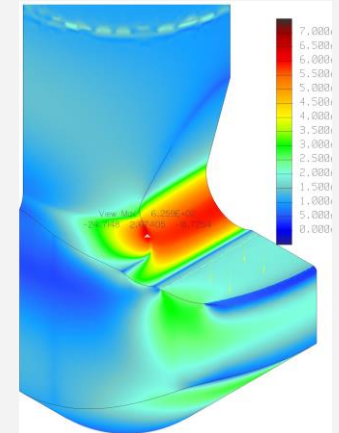
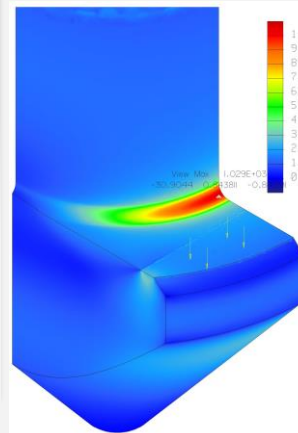
FATIGUE

Case III, Snag load*	Fatigue σ	Fatigue τ	Fatigue Comb**
1080.0	1080.0	1080.0	---
753.3	161.6	93.3	0.48
261.6	58.6	32.6	0.25
4.13	18.42	33.16	---
2.88	2.76	2.86	1.92

FATIGUE
 set forth by 3.1.5 of the Spec.
 values, but rather normalized values nation.

FEM Case III, Snag	Overload*	Fatigue σ
1080.0	1080.0	1080.0
600.0	753.3	186.3
317.0	238.5	102.5
3.41	4.53	10.53

DED SHANK



Advanced Analysis and FEA Design Improvement

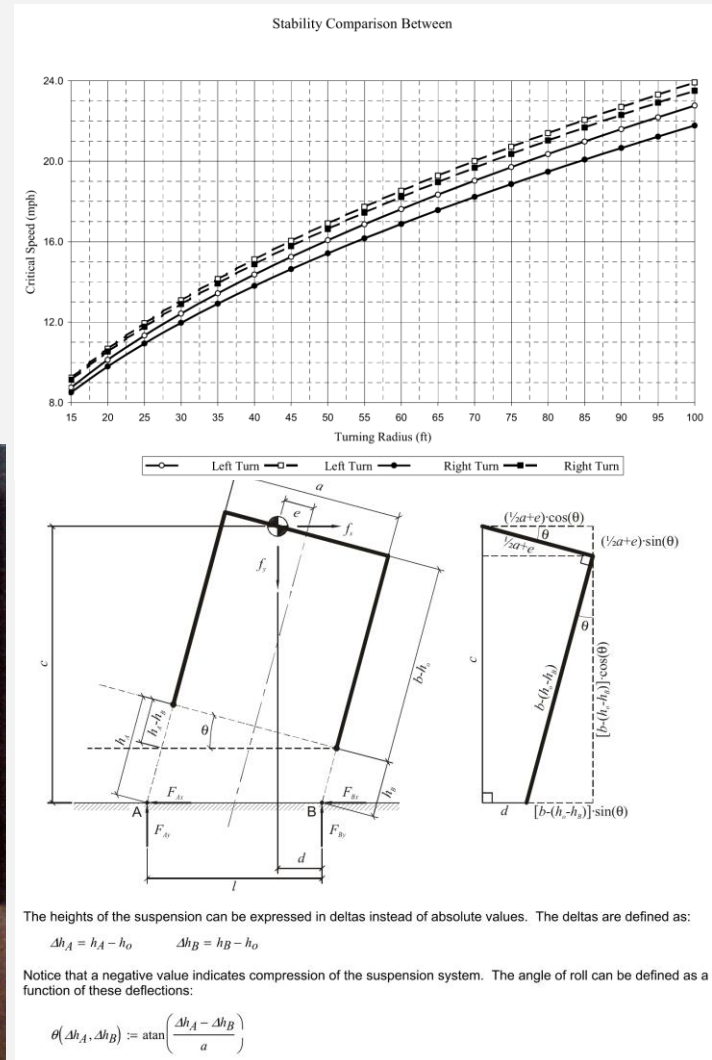
Mechanical Failure Investigation

Accident Investigation

Mechanical Failure Analysis

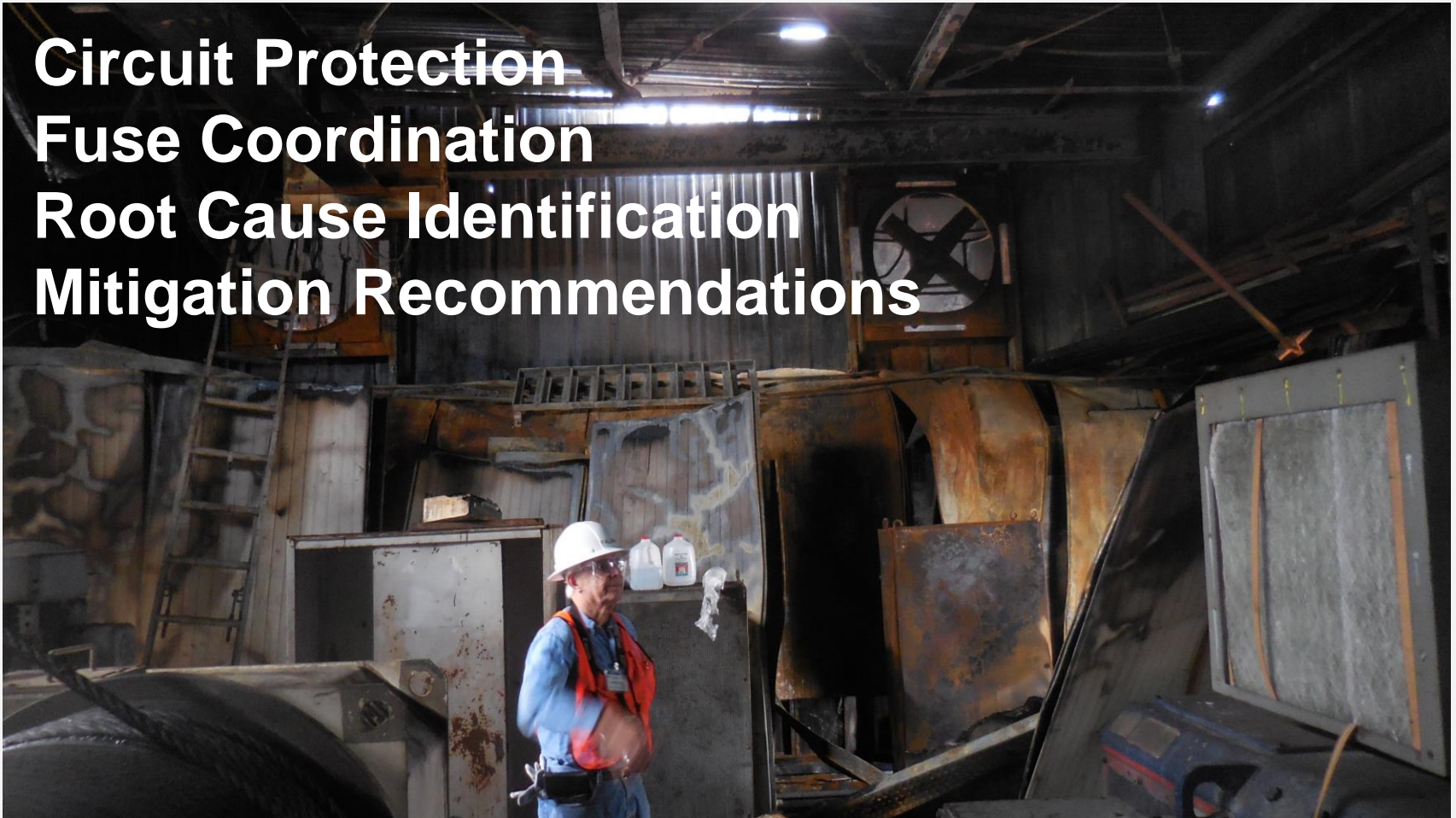
Root Cause Identification

Expert Witness



Electrical Failure Investigation

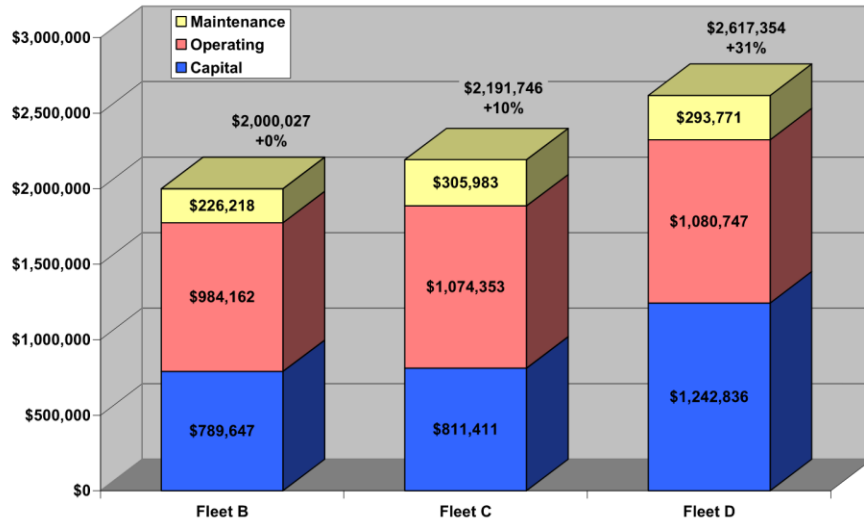
Circuit Protection
Fuse Coordination
Root Cause Identification
Mitigation Recommendations



Engineering Studies

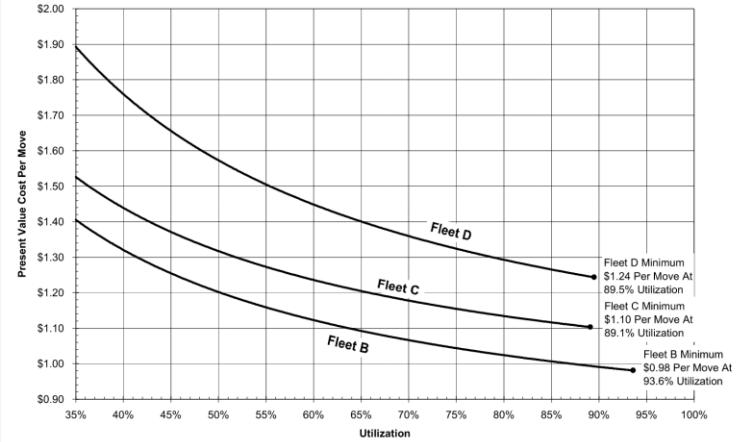
Present Value Cost For Equivalent Throughput At 50% Utilization

Values in U.S. Dollars

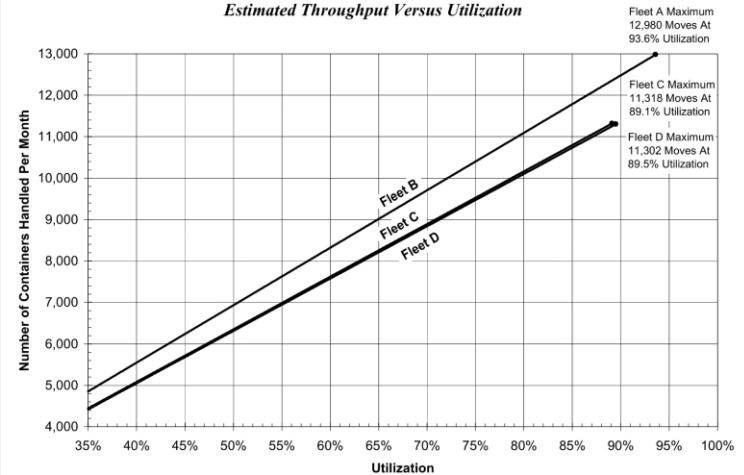


Cost Per Move Versus Utilization

Values in U.S. Dollars



Estimated Throughput Versus Utilization



Thank You

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www.Liftech.net

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