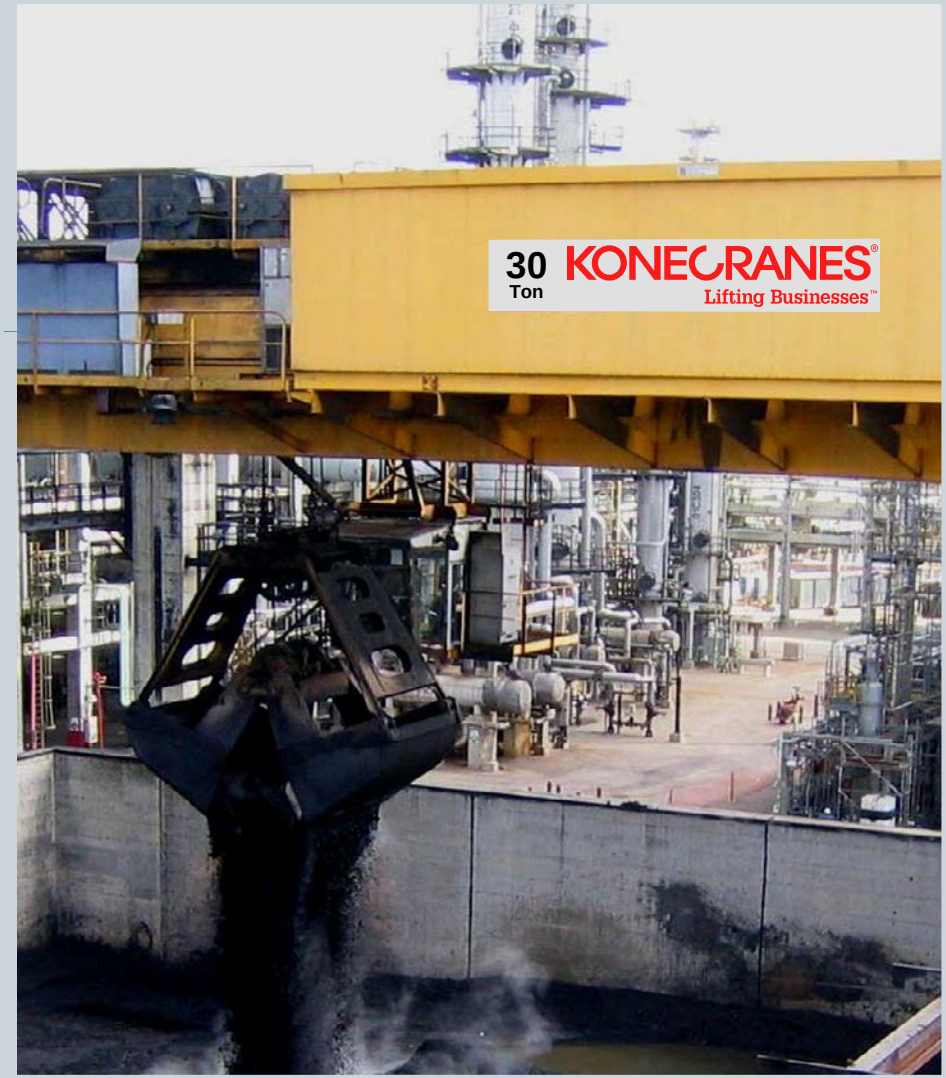
KONECRANES®
Lifting Businesses™

Coke Handling Cranes

From Konecranes



Coking.com® Conference
RIO, BRAZIL 2009

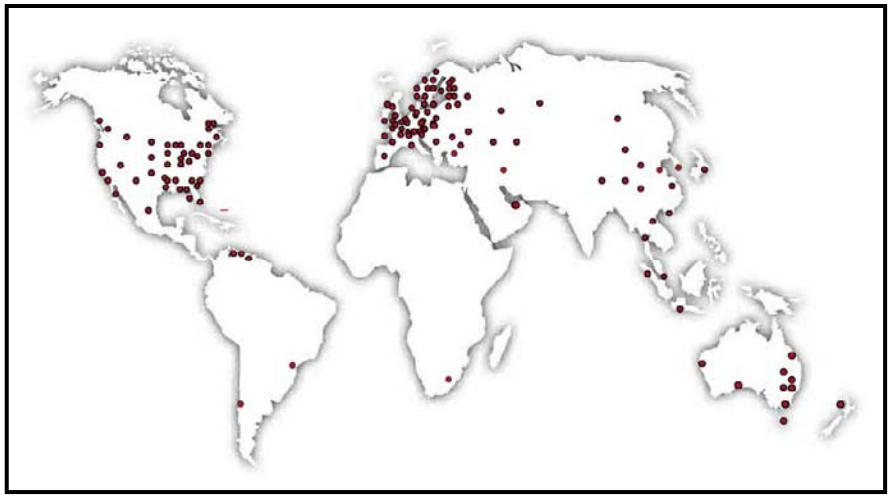
Don Paulino
Konecranes America, Inc.

Konecranes

KONECRANES®
Lifting Businesses™

Around the World

- Global crane builder with US$2.5 billion annual sales
- Over 8500 employees in 43 countries
- World's largest manufacturer of process cranes
- World's largest crane service company with over 300,000 cranes under service contract
- Annual production includes:
  - Over 400 process cranes
  - 13,000 industrial cranes and hoists
  - 60,000 motors
  - 5,000 motor controls
  - 4,500 heavy service gearboxes



SAFETY, RELIABILITY, PRODUCTIVITY

Konecranes in Brazil

- **Konecranes Talhas, Pontes Rolantes e Serviços Ltda is located in Barueri / state of São Paulo.**
- **Cranes sales, Spare parts sales**
- **Crane services**
  - **On calls**
  - **Inspections**
  - **Predictive maintenance**
- **Customers References in Bra**
  - **Aracruz**
  - **Metso**
  - **Voith**
  - **International Paper**
  - **Veracell**
  - **Arcelor Mittal**
  - **Estaleiro Atlantico Sul**
  - **Klabin**
  - **Alstom**
  - **Siemens Vai**
  - **ThyssenKrupp**
  - **Terminal Containers da Paranagua, TCP**
  - **Wellstream**

- Contacts of Konecranes Brazil
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SAFETY, RELIABILITY, PRODUCTIVITY

User's List

KONECRANES®
Lifting Businesses™

Ordered	Customer	Project	Qty.	Capacity	Bucket
2009	Naftogaz India Ltd.	HMEL, Bathinda, India	1	40 MT	20 M. Mech.
2008	Fluor	TOTAL, Port Arthur, TX	1	44 Ton	25 Yd. Mech.
2008	Punj Lloyd, Ltd.	Indian Oil Co., Baroda	1	44 MT	25 M. Mech.
2008	Fluor	Marathon, Detroit, MI	1	30 Ton	17 Yd. Mech.
2007	Naftogaz India Ltd.	BORL, Bina, India	1	33 MT	15 M. Mech.
2007	Fluor	Marathon, Garyville, LA	1	30 Ton	17 Yd. Mech.
2006	Bechtel - France	Reliance India	2	35 MT	20 Yd. Mech.
2006	Fluor	Tesoro Golden Eagle, CA	1	44 Ton	25 Yd. Mech.
2006	Foster Wheeler Iberia	BP Spain	1	17 MT	8 M. Mech.
2005	Bechtel, ConocoPhillips	Borger Refinery, TX	1	30 Ton	17 Yd. Mech.
2004	ConocoPhillips	Alliance Refinery, LA	1	18 Ton	10.5 Yd. Mech.
2003	Larsen & Toubro	Indian Oil Co., Panipat	1	44 MT	25 M. Mech.
2001	Bechtel	Hovensa, St.Croix	1	45 Ton	25 Yd. Mech.
2000	Foster Wheeler	Sincor, Venezuela	2	25 m-ton	11.5 M. Mech.
2000	SK Engineering	PEMEX, Madero	2	27 ton	18 Yd. Mech.
2000	Bechtel	Marathon, Garyville, LA	1	27 Ton	17 Yd. Mech.
1998	Consorcio Contrina	VEHOP, Venezuela	2	22 m-ton	12.5 Yd. Mech.
1997	Chiyoda Corp.	Melaka Refinery	1	15 m-ton	8 M. Mech.
1996	Foster Wheeler	Lyondell Citgo, TX	2	27 ton	18 Yd. Mech.
1991	Bechtel / Conoco	Billings, MT	1	8 ton	4 Yd. Mech.
1990	Bechtel	Star - Port Arthur, TX	1	25 ton	17 Yd. Mech.
1984	Texaco	Anacortes, WA	1	17 Ton	8 Yd. Hyd.
1983	Fluor	Puget Sound Plant, WA	1	14 ton	8 Yd. Hyd.
		Total	28		

COKER CRANE TYPES

KONECRANES®
Lifting Businesses™

- BRIDGE TYPE WITH FIXED HOPPER
- SINGLE LEG GANTRY TYPE – FIXED HOPPER
- SINGLE LEG GANTRY TYPE – TRAVELING HOPPER
- SINGLE LEG GANTRY w/CANTILEVER

SAFETY, RELIABILITY, PRODUCTIVITY

BRIDGE TYPE WITH FIXED HOPPER

KONECRANES®
Lifting Businesses™

22 M Ton w/ 12.5 Cu.M. Bucket

30 Short Ton w/17 Cu.Yd. Bucket

SAFETY, RELIABILITY, PRODUCTIVITY

SINGLE LEG GANTRY with FIXED HOPPER & CANTILEVER

KONECRANES®
Lifting Businesses™

44 M Ton w/ 25 Cu.M. Bucket

SAFETY, RELIABILITY, PRODUCTIVITY

SINGLE LEG GANTRY with MOTORIZED TRAVELING HOPPER

KONECRANES®
Lifting Businesses™

View of Hopper from inside Operator's Cab

SAFETY, RELIABILITY, PRODUCTIVITY

SINGLE LEG GANTRY with ON BOARD HOPPER & CANTILEVER

KONECRANES®
Lifting Businesses™

25 M Ton w/ 11.5 Cu.M. Bucket

SAFETY, RELIABILITY, PRODUCTIVITY

SINGLE LEG GANTRY with ON BOARD HOPPER on CANTILEVER. LOADS RAILCARS

KONECRANES®
Lifting Businesses™

27 Short Tons w/
18 Cu Yd Bucket

SAFETY, RELIABILITY, PRODUCTIVITY

DATA ANALYSIS

KONECRANES®
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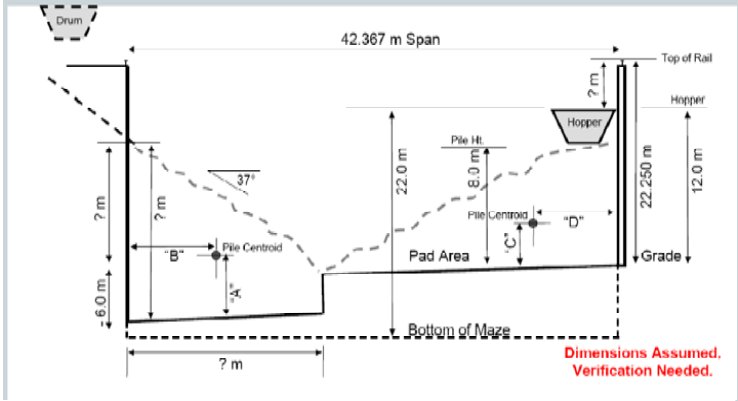
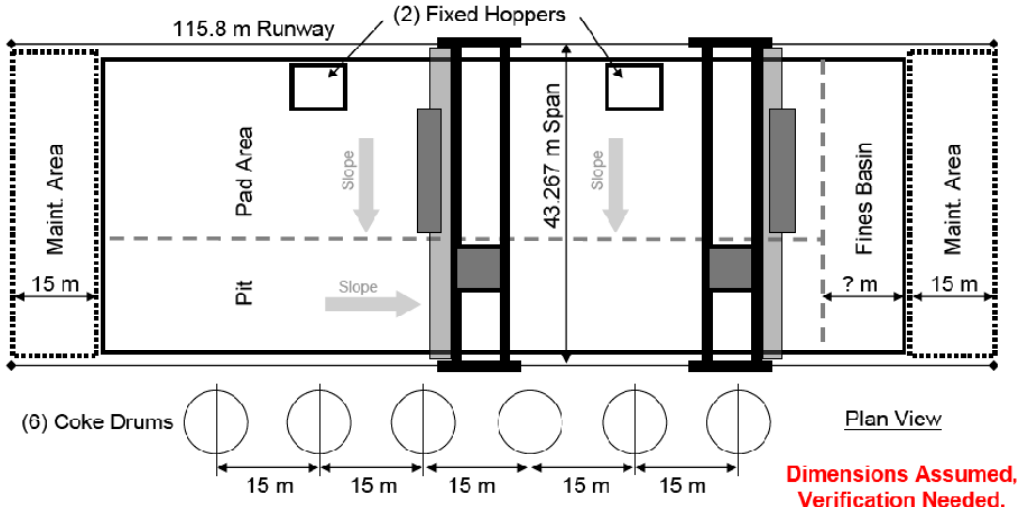
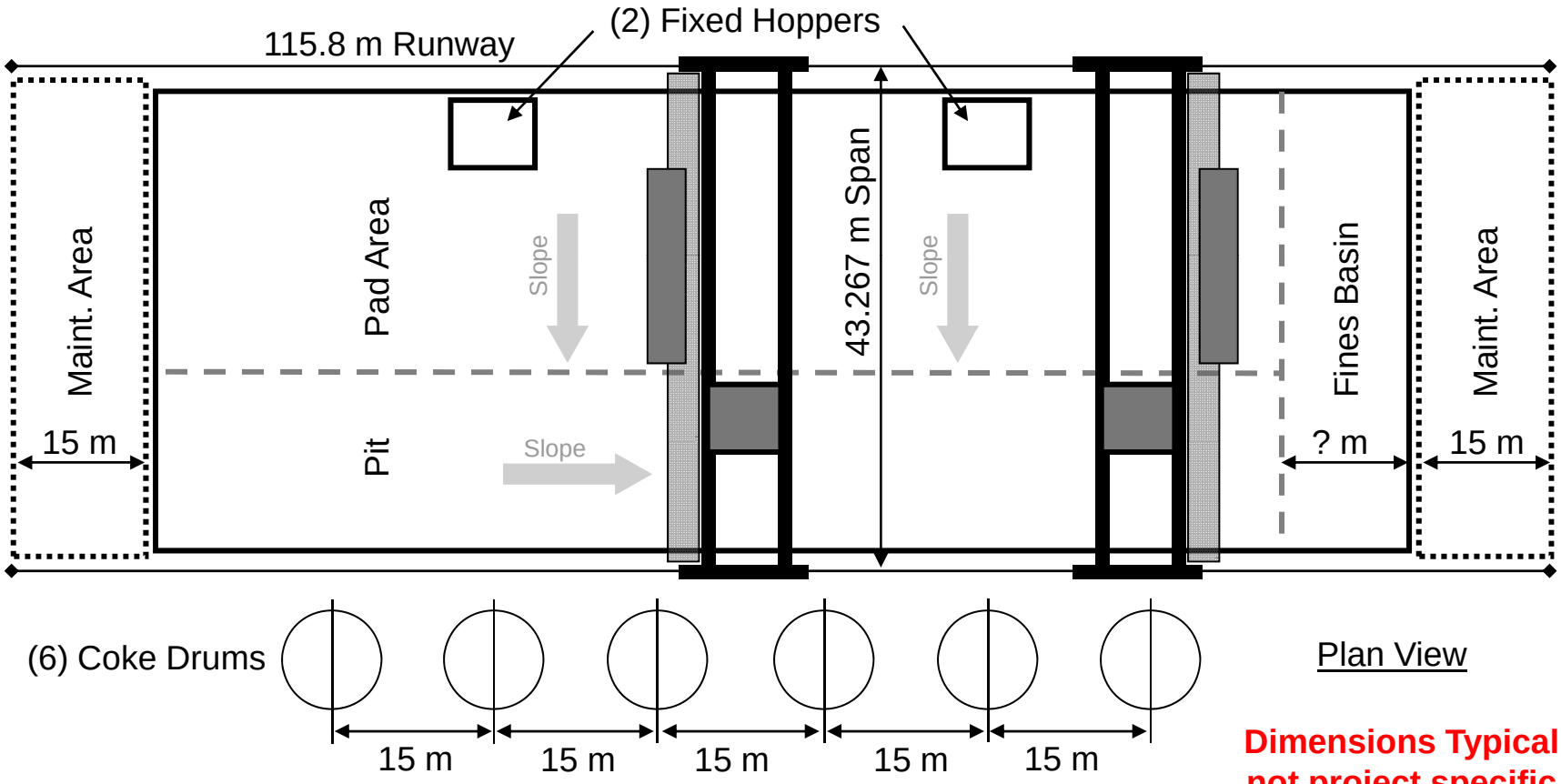
- Analyzing the layout
- Analyzing the operations plan
- Determining the tons per hour handling rate
- Calculating the Material Flow Path
- Selecting the bucket size & crane speeds
- Work Cycle Analysis





SAFETY, RELIABILITY, PRODUCTIVITY

Analysis
Pit Layout
Plan View (finds long travel dimen)



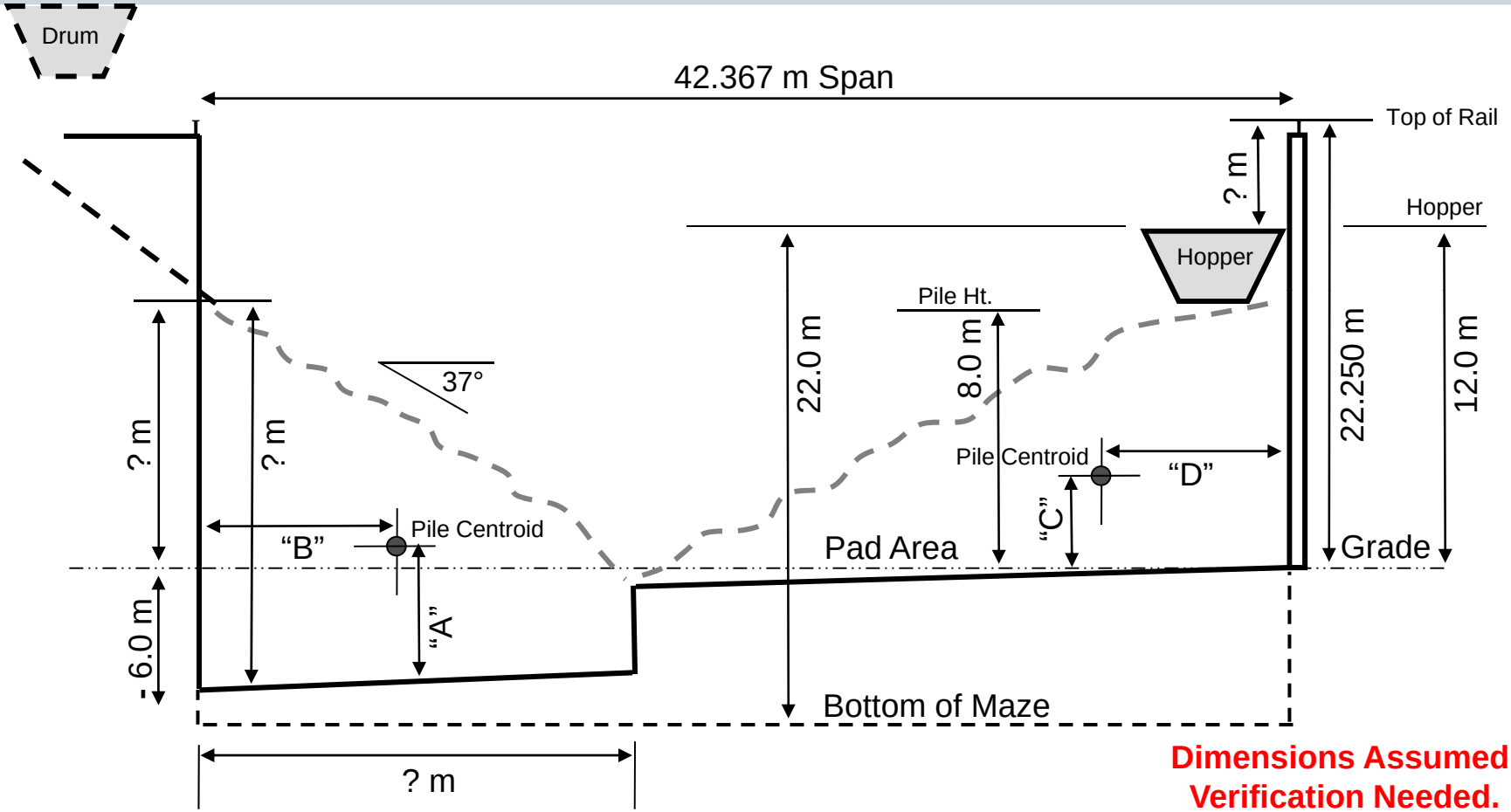
Plan View

Dimensions Typical, not project specific.

SAFETY, RELIABILITY, PRODUCTIVITY

Analysis
Pit Layout
Elevation View (find trolley and hoist dist)

KONECRANES®
Lifting Businesses™



Dimensions Assumed, Verification Needed.

SAFETY, RELIABILITY, PRODUCTIVITY

WORK CYCLE CALCULATION

KONECRANES® Lifting Businesses™

WORK CYCLE CALCULATION — KONECRANES® Lifting Businesses™

Proposal#	**KCL-23718**										
Date:	**###**	**Version:**	**1**								
SINGLE MOVE= DRUM DISCHARGE TO HOPPER											
AVERAGE CAPACITY	**Case A: PIT TO HOPPER DIRECTLY**										
TYPICAL REFINERY											
	40 TON CRANE										
	20 cubic meter mechanical bucket										
	Pit area (m x m)	**45 x 110**									
	Lifting height (m)	**31**									
Line					**Operating Time (s)**						
1									overlapped		
2							not overlapped				
3						partly overlapped					
4					travel		closing	hoist.			
5					(m)		mach.	mach.	bridge	trolley	
6	Action										
7	1	Closing the bucket			**12.8**		12.6				
8	2	Hoisting			**12**		12.0	12.0			
9	3	Travelling to Pad Storage (trolley)			**28**					20.3	
10	4	Travelling to Pad Storage (bridge)			**20**				22.0		
11	5	Lowering to Hopper Discharge			**0**		0.0				
12	6	Weighing				n/a					
13	7	Open the bucket					8.8				
14	8	Raising open bucket to clear sill beam.			**0**	n/a	0.0				
15	9	Travelling to the pit (bridge)			**20**				22.0		
16	10	Travelling to the pit (trolley)			**28**					20.3	
17	11	Lowering			**12**		12.0	12.0			
18		Running time / machinery					45	24	44	41	
19		**Cycle time (s) =**	**86**				21		44	21	
21		Motor On-Time Percentage		**ED %**			**53**	**28**	**51**	**47**	
23		Hoisting speed (mpm)		**80**	acc. time (s) =			**3.0**			
24		Trolley speed (mpm)		**110**				**5**			
25		Bridge speed (mpm)		**80**				**7**			
26		Bucket volume (cubic meters)		**20**							
27		Coke density (kg / cubic m.)		**721**							
28		Filling factor avg.		**0.85**							
29		Load (tonnes)		**12.3**							
31		**AVERAGE NUMBER OF CYCLES**				**33**	**cycles / one hour**				
32		**(80 % operator efficiency factor)**									
34		**AVERAGE CRANE CAPACITY**				**411**	**tons / one hour**				
35		**(80 % operator efficiency factor)**									

TYPICAL EXAMPLE OF A WORK CYCLE CALCULATION:

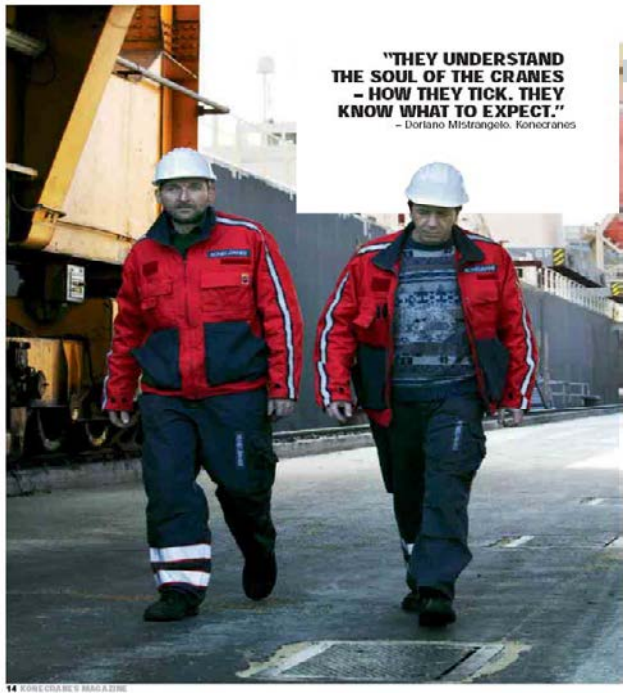
INDICATES 40 TON CRANE WITH 20 CUBIC METER BUCKET WITH SPEEDS SELECTED TO MOVE 411 TONS PER HOUR.

SAFETY, RELIABILITY, PRODUCTIVITY

BENEFITS OF LONG TERM OPERATIONS & MAINTENANCE CONTRACTS

KONECRANES®
Lifting Businesses™

- KEY TO HIGHEST LEVELS OF PERFORMANCE AND .RELIABILITY
- FASTER START-UP AND PRODUCTION RAMP-UP
- CRANE AVAILABILITY = 99% +
- LOWER OPERATING COSTS OVER LONG TERM
- LESS DAMAGE TO CRANE AND ITS SURROUNDINGS
- PERFORMANCE AND AVAILABILITY GUARANTEES



Allows refinery management to concentrate human resources on it's core competence!

SAFETY, RELIABILITY, PRODUCTIVITY

OPERATIONS & MAINTENANCE CONTRACTS:

KONECRANES®
Lifting Businesses™

(Contract term can be 3 to 5 years with annual reviews)

ACCOMPLISHED WITH:

- HIGHLY TRAINED AND SKILLED PERSONNEL
- CROSS TRAINING OF OPERATORS & TECHNICIANS
- DEDICATED PROFESSIONALS WITH EQUIPMENT OWNERSHIP.
- SPECIFIC TRAINING ON COKER CRANES
- EXPERIENCE WITH THE CRANE SYSTEMS

SAFETY, RELIABILITY, PRODUCTIVITY

Principal Issues

KONECRANES® Lifting Businesses™

Safety

Konecranes Solutions

Design for Improved Safety

Crane Operator's Environment:

- Enclosed A/C Cab with HEPA particulate filter
- Purafil chemical filter.
- Enclosed environmentally controlled E-Room
- Filtered air
- Out-of-elements electrical maintenance
- AutOPilot Semi-Automation
- Independent Traveling Cab

SAFETY, RELIABILITY, PRODUCTIVITY

Safety

Operator's Cab

Rotating Chair

Full Vision Cab

Windows open for cleaning, windshield wipers on 3 sides

SAFETY, RELIABILITY, PRODUCTIVITY

CABIN CHEMICAL FILTER

KONECRANES®
Lifting Businesses™

- Cleans air for Crane Operator
- Great Benefit to Operator's Health
- Stainless Steel Enclosure
- Compact Design for Tight Space
- Make-up Air for Cab Pressure

SAFETY, RELIABILITY, PRODUCTIVITY

Safety

KONECRANES®
Lifting Businesses™

Environment

Corrosive Coke Pit Environment:

- Moisture / Steam
- Corrosive Fumes
- Ignitable Fumes
- Conductive Dust
- Exposed to Rain, Ice, Weather
- Abrasive Coke Dust
- Hazards for Operators

SAFETY, RELIABILITY, PRODUCTIVITY

Principal Issues

KONECRANES®
Lifting Businesses™

Reliability

Limited Time Available for Maintenance:

- Short weekly maintenance intervals
- Infrequent turnarounds for major repairs

Konecranes Solutions

Maintenance Reducing Features:

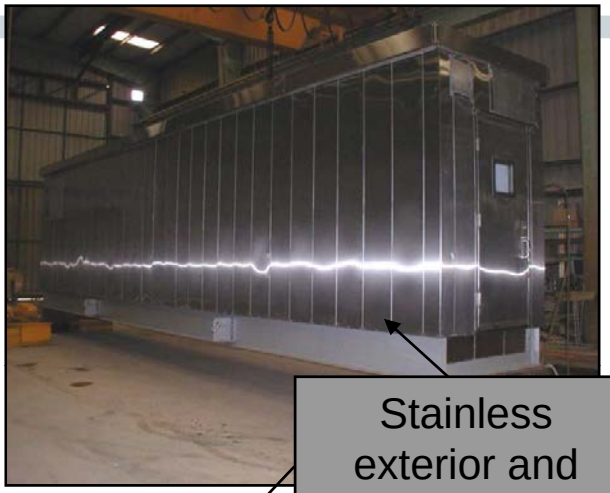
- Control House, Pressurized, with A/C
- Wired-In Spare Inverters
- Regenerative Network Braking
- Platformed Maintenance Access for All Mechanical and Electrical Components
- Inverter Duty Motors
- Improving access to components
- Designing longer lifetimes

SAFETY, RELIABILITY, PRODUCTIVITY

Control House

KONECRANES®
Lifting Businesses™

Walkway and emergency lighting



Stainless exterior and doors

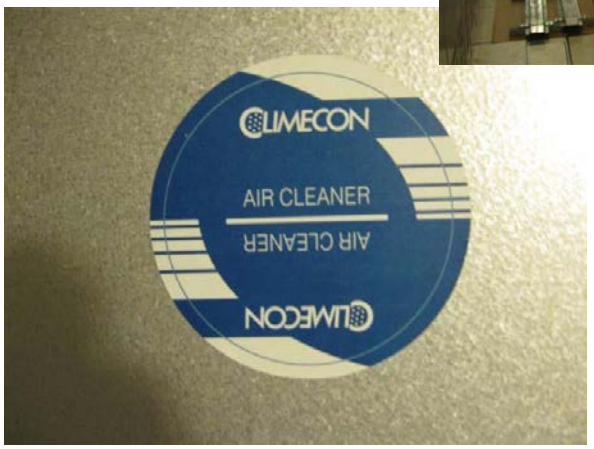
Computer floor removed for final wiring

SAFETY, RELIABILITY, PRODUCTIVITY

CONTROL HOUSE
CHEMICAL FILTRATION

KONECRANES®
Lifting Businesses™

Installed inside E room



Recirculates E Room air thru filter to remove corrosives.

SAFETY, RELIABILITY, PRODUCTIVITY

Reliability

KONECRANES®
Lifting Businesses™

Resistor Issues

Resistor Bank Problems:

- Coke Dust on Resistors
- Reduced Resistance, Burn-Out
- Damage to Inverter Drives
- Maintenance Time for Cleaning

Konecranes DynAReg

Regenerative Control:

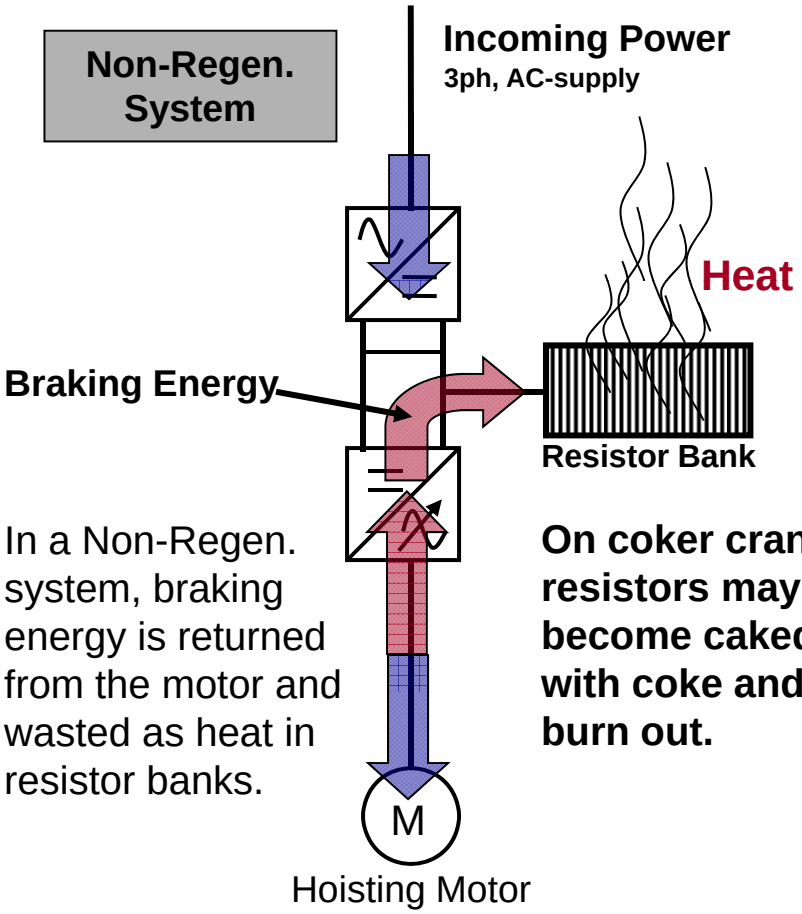
- Eliminates Braking Resistors
- Reduced Risk of Failures
- Reduced Maintenance Time
- Active Front End Cleans Incoming Power, Protecting Drives
- Power Going Back to Grid is Cleaned, Protecting Adjacent Equipment

SAFETY, RELIABILITY, PRODUCTIVITY

Konecranes DynAReg
Regenerative Control
Energy Flow – Regeneration

KONECRANES® Lifting Businesses™

Non-Regen. System

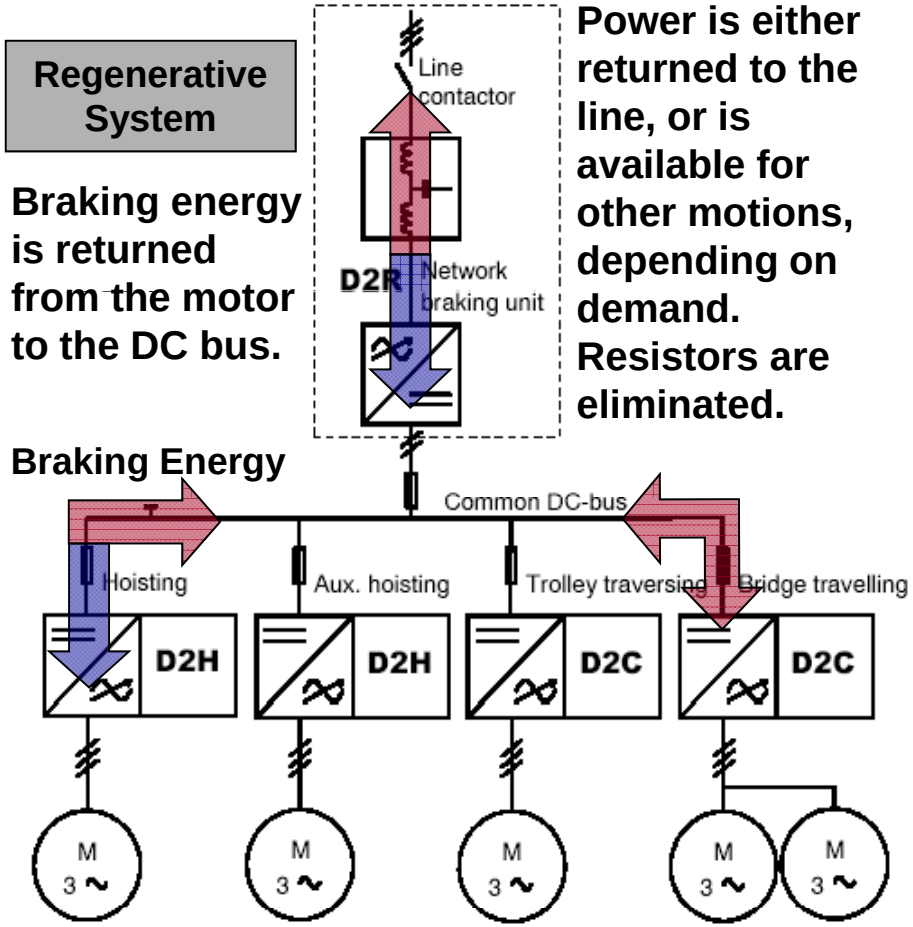


In a Non-Regen. system, braking energy is returned from the motor and wasted as heat in resistor banks.

On coker cranes, resistors may become caked with coke and burn out.

Regenerative System

Braking energy is returned from the motor to the DC bus.



Power is either returned to the line, or is available for other motions, depending on demand. Resistors are eliminated.

SAFETY, RELIABILITY, PRODUCTIVITY

Hoist Control

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Lifting Businesses™

DynAGrab Synchonization Controller

Features:

- Load Balancing
- Automatic Sinking & Filling
- Enhanced Speed vs. Load Control
- Fast Stop / Slack Rope Control
- Drum Rotation Synchronization
- Fault Detection
- Jammed Grab Detection
- SAFETY: Overload Protection
- Less Demanding of Operator
- Higher Coke Handling Thru-put

SAFETY, RELIABILITY, PRODUCTIVITY

Productivity

KONECRANES®
Lifting Businesses™

Load Control

Damage from Collisions:

- Bucket impacts on hopper
- Bucket impacts on pit wall
- Difficulties in fines basins
- Excessive load spillage

DynAPilot Sway Control

Sway Dampening / Zone Control:

- Reduced load sway
- Restricted areas (pit walls, hopper)
- Smart Limits / Reduced Creep Areas
- Quicker, safer movements
- Reduced spillage at hopper
- Eliminates lost time caused by load swinging

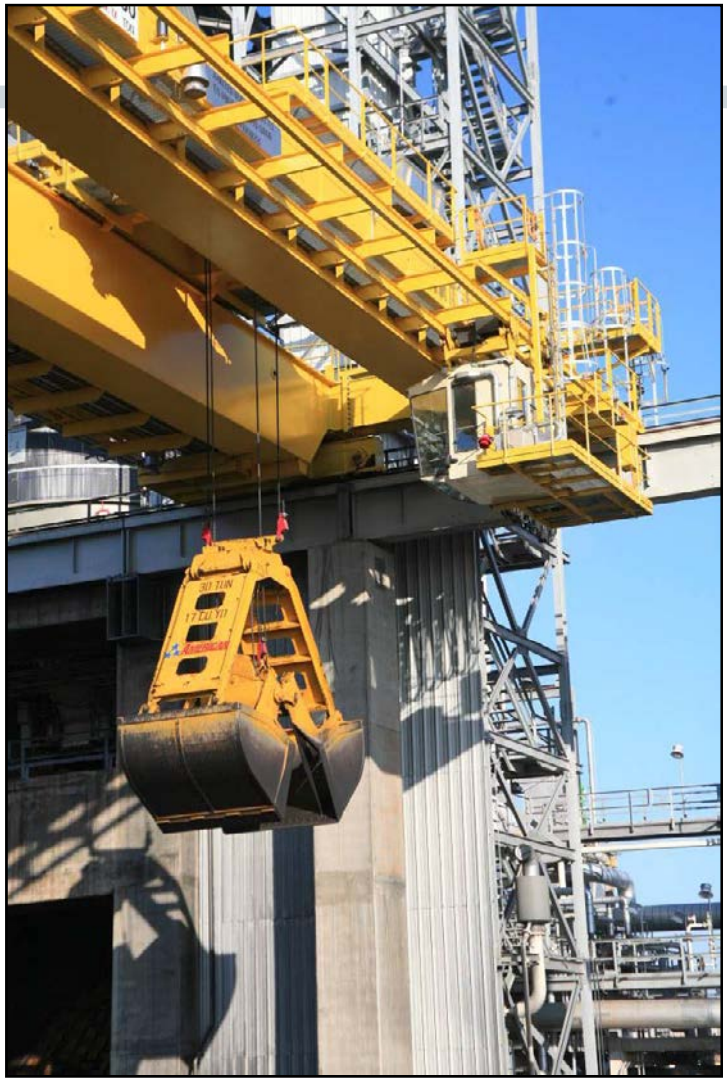
SAFETY, RELIABILITY, PRODUCTIVITY

CMS

KONECRANES®
Lifting Businesses™

Konecranes Data Archiving

- On Board Computer System
- Over 400 data points monitored on a typical coker crane
- Voltage, current, temperature, over/under speed, brake wear, limit switches, etc.
- Reports on status, condition and faults on operator display panel.
- Remote data access option.
- Alert user to potential problems before they are catastrophic
- Analyze data from the manufacturing process
- Real time reporting
- 4-Year Operating History Archive



SAFETY, RELIABILITY, PRODUCTIVITY

Maintenance Data Analysis

KONECRANES®
Lifting Businesses™

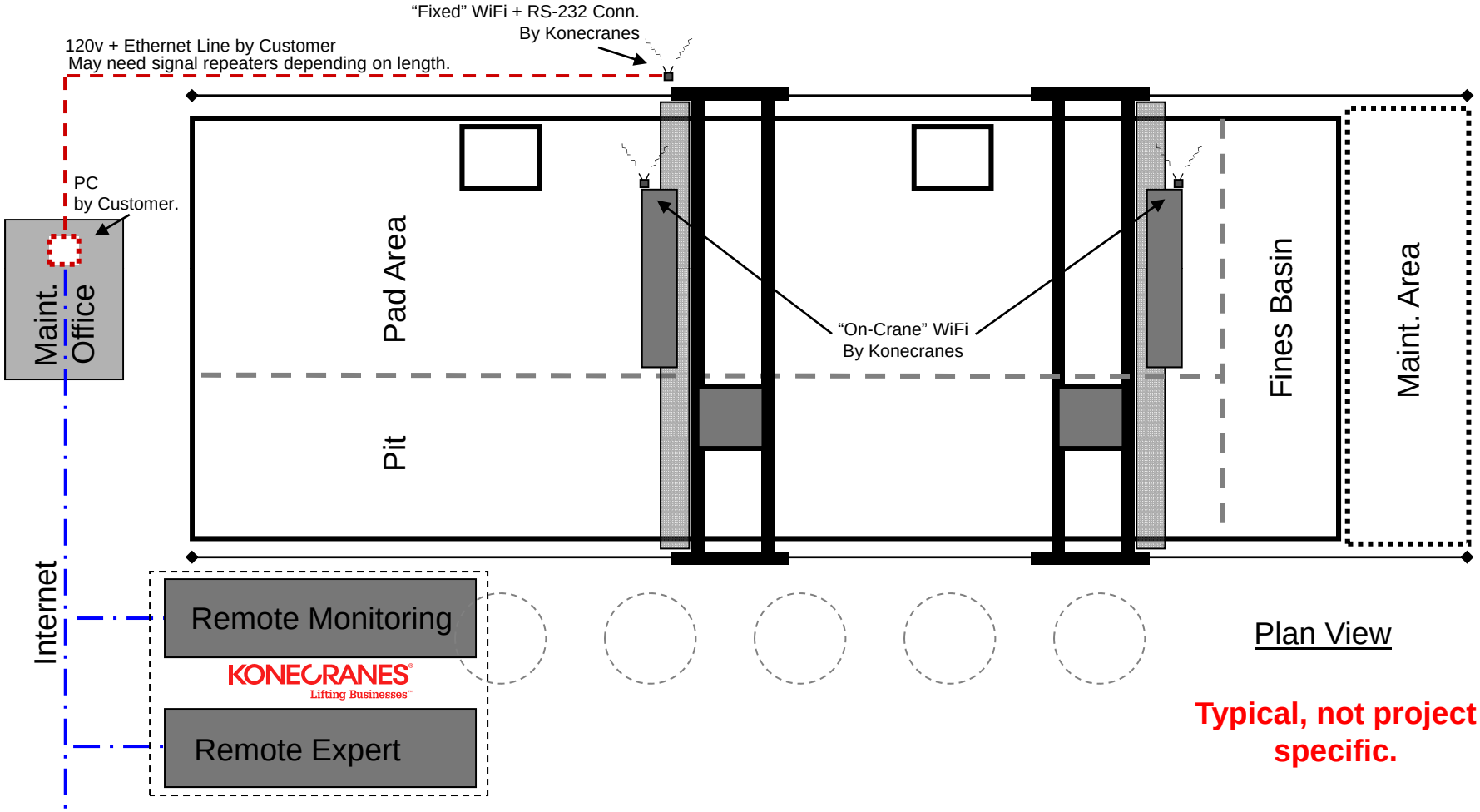
CMS & Remote Monitoring

- Real time data is available in multiple locations
- Troubleshoot problems before getting on crane
- Remote Expert Assistance
- Diagnose problem off line in clean, safe environment
- Predictive maintenance can adjust maintenance intervals to suit changing crane usage
- Promotes Pro-active vs. Re-active Maintenance
- Remote to Maintenance Office

SAFETY, RELIABILITY, PRODUCTIVITY

CMS-WiFi Diagram
Typical Pit Layout

KONECRANES®
Lifting Businesses™



Plan View

Typical, not project specific.

SAFETY, RELIABILITY, PRODUCTIVITY

Reliability

KONECRANES®
Lifting Businesses™

Runways

Structure Problems:

- Skewing of Bridge Effects Rail Alignment
- Damage to Rail Attachments
- Misalignment of Beams and Columns
- Wheel and Rail Wear
- Stress on Wheel Bearings and Crane Structure

DynATrak

Konecranes Auto-Steering Control:

- Harmful Lateral Loads Virtually Eliminated
- Dramatic Reduction in Wheel/Rail Wear
- Reduced Stress on Wheel Bearings
- Reduced Stress to Crane Structure
- Alignment of Runway Preserved
- Improves Safety by Limiting Structural Overloads

SAFETY, RELIABILITY, PRODUCTIVITY

DynaTrak
(Laser Guided Tracking)

KONECRANES®
Lifting Businesses™

U.S. Patent # 5,866,997

- **Automatic Steering**
- **Centering wheels on rail**
- **Reduces lateral loads**
- **Minimizes wheel wear and loads to runway structure.**

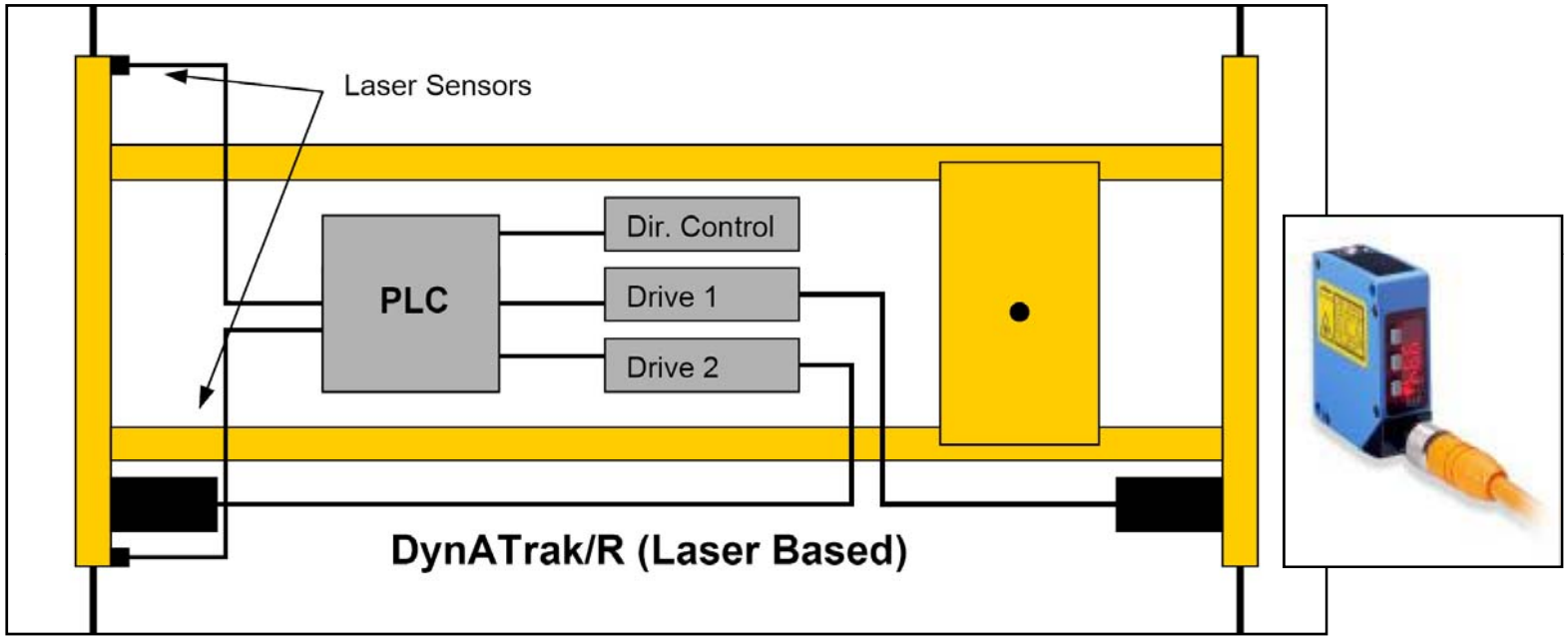
SAFETY, RELIABILITY, PRODUCTIVITY

Konecranes DynATrak

KONECRANES®
Lifting Businesses™

Laser-Based DynATrak/R

U.S. Patent # 5,866,997



- **PLC drives bridge via 2 separate inverters**
- **Laser measurement maintains constant flange-to-railhead distance**

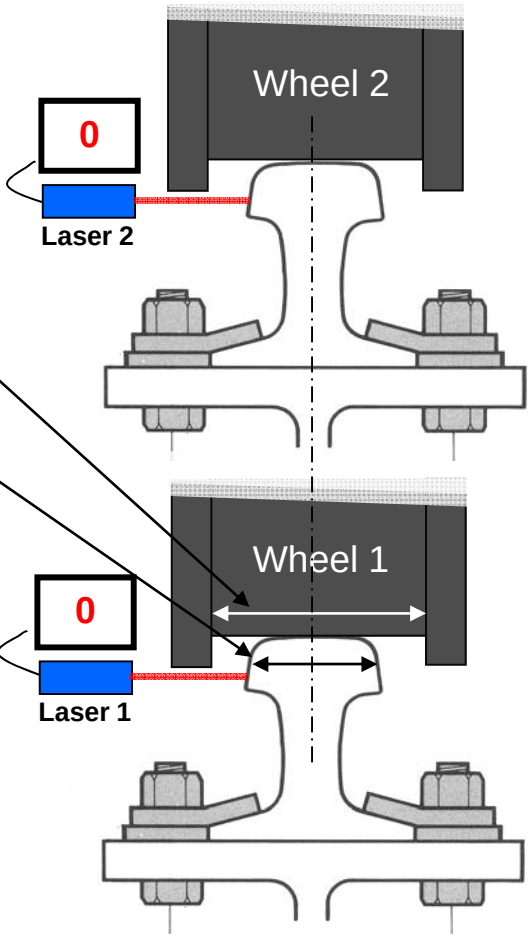
SAFETY, RELIABILITY, PRODUCTIVITY

Productivity

KONECRANES® Lifting Businesses™

Other Systems Don't Prevent Flanging

Normal Running



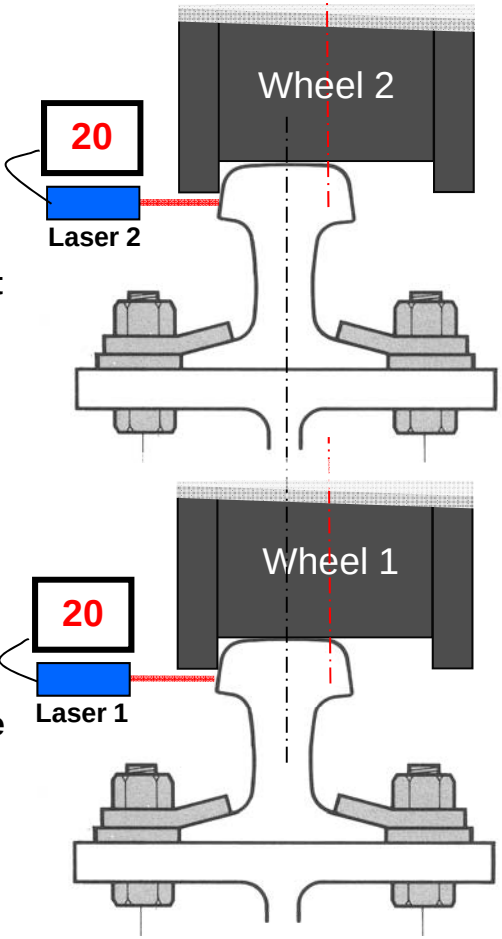
Example :

Wheel Tread = 145mm

Rail Head = 105mm

Wheel Float = 40mm

Drift Condition



Typical Anti-Skew Systems do not prevent or correct flanging, they only keep crane bumpers equidistant from the end stops.

Here, even though the crane is not skewed, it has drifted over, and the flanges are contacting the rail head.

SAFETY, RELIABILITY, PRODUCTIVITY

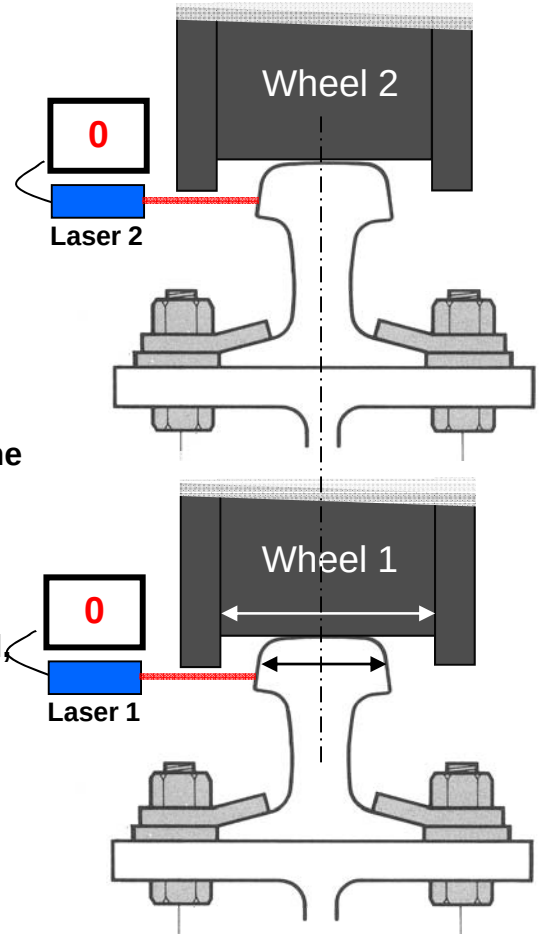
Productivity

KONECRANES® Lifting Businesses™

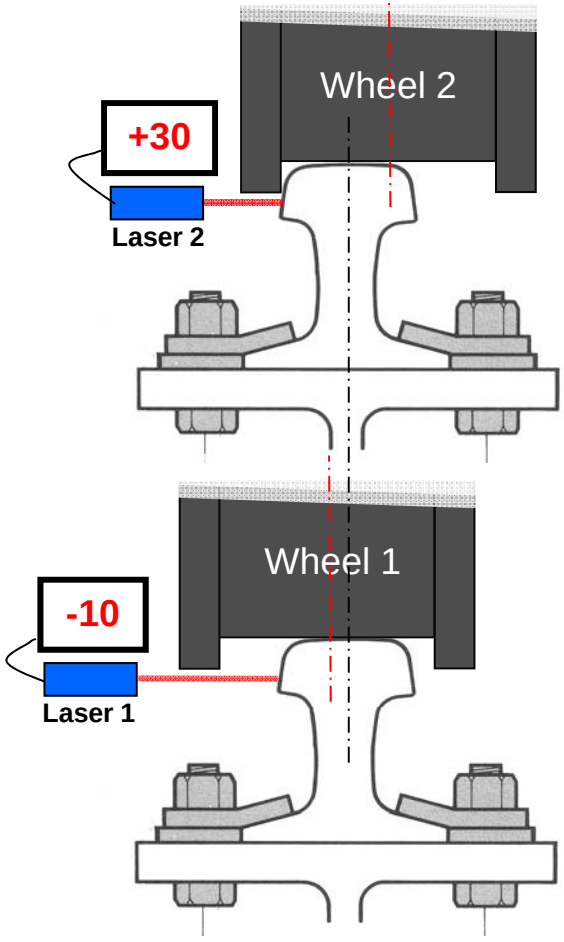
Anti-Flanging and Anti-Skew

Normal Running

DynATrak/P prevents both skewing and drifting, by "steering" the crane to center the wheels on the rail, reducing flange and rail wear and reducing skew forces to the rail, rail attachments and runway structure.



Skew Condition



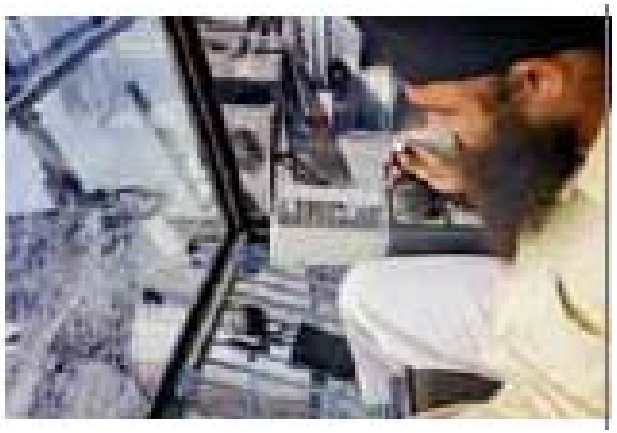
SAFETY, RELIABILITY, PRODUCTIVITY

OPERATOR SAFETY

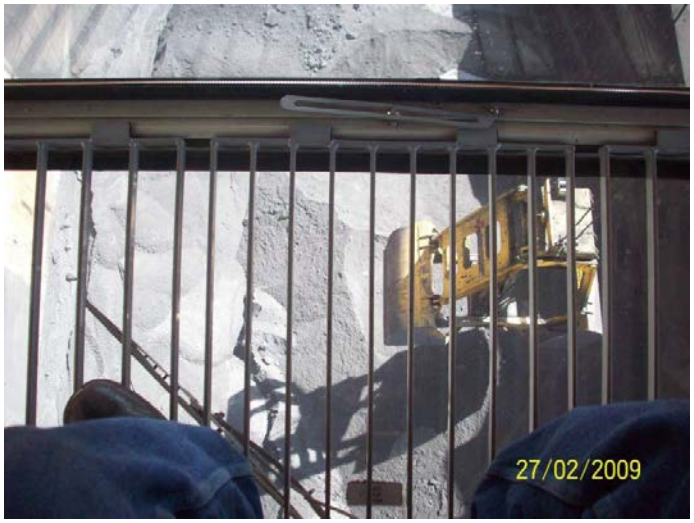
BACK SAVER SYSTEM

KONECRANES®
Lifting Businesses™

Operator's Normal Posture: Back Bent Over



Operator's view of bucket digging



SAFETY, RELIABILITY, PRODUCTIVITY

BACK SAVER VISION SYSTEM

KONECRANES®
Lifting Businesses™

- LOOK DOWN CAMERA INSIDE CAB

SAFETY, RELIABILITY, PRODUCTIVITY

OPERATOR CAN LOOK AHEAD WITH BACK SUPPORTED AGAINST BACKREST

KONECRANES®
Lifting Businesses™

SAFETY, RELIABILITY, PRODUCTIVITY

Independent Traveling Cab

KONECRANES®
Lifting Businesses™

- Mounted on twinTrack monorail
- Independent traveling
- Operator selects best location on span
- Increased safety away from vapors.
- Best line of vision can be selected.
- Increased comfort level
- Improved operator ride comfort

SAFETY, RELIABILITY, PRODUCTIVITY

Reliability Solutions:

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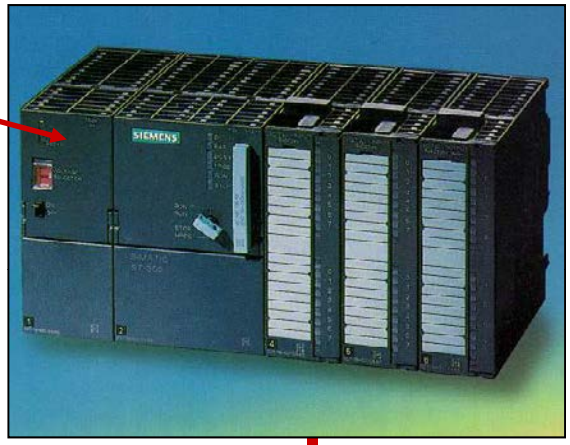
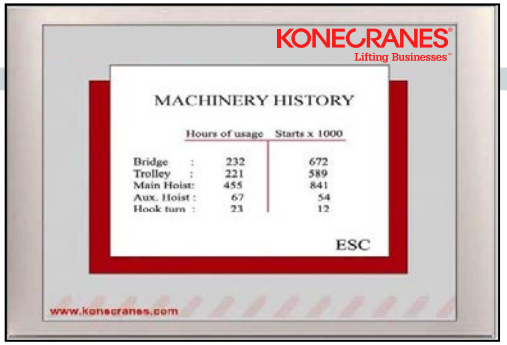
Lifting Businesses™

PLC Platform

Programmable Logic Controller (PLC)





Operator's Panel

Drive commands
Status Request

Status Response
Diagnostic data

Communication
via Profibus Cable

Konecranes Inverter Controls




- Encoders
- Laser
- Sensors
- Radio
- etc.

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PLC Platform –

inside Control House

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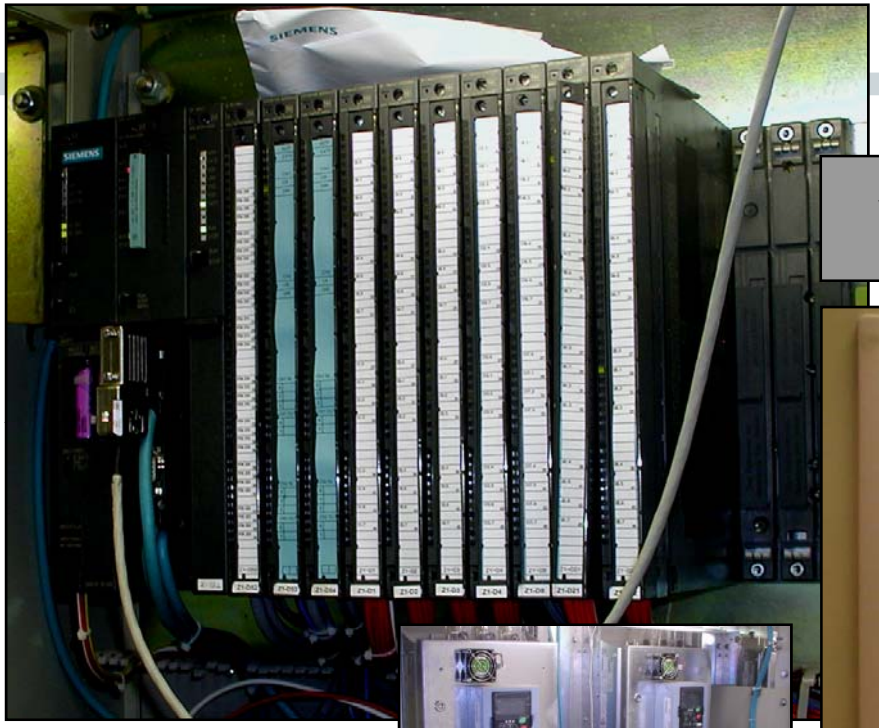
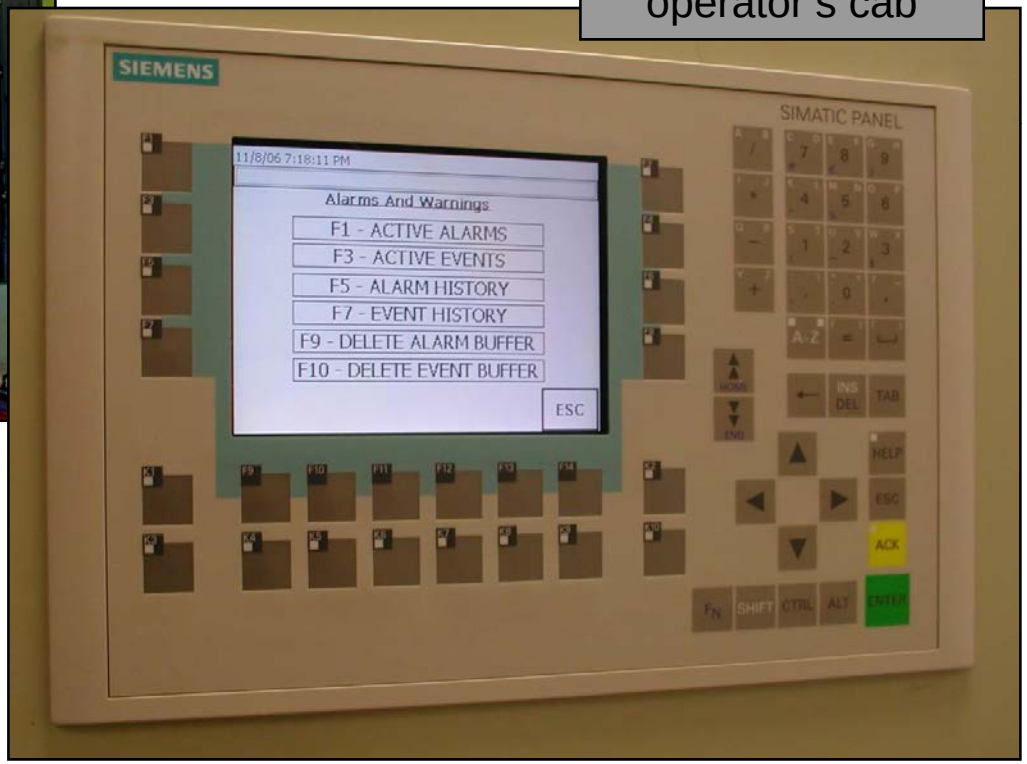


Siemens S7 PLC

HMI panels in control house and operator's cab



Primary and spare trolley inverters with profibus connection to PLC

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HMI OPERATOR DISPLAY PANEL

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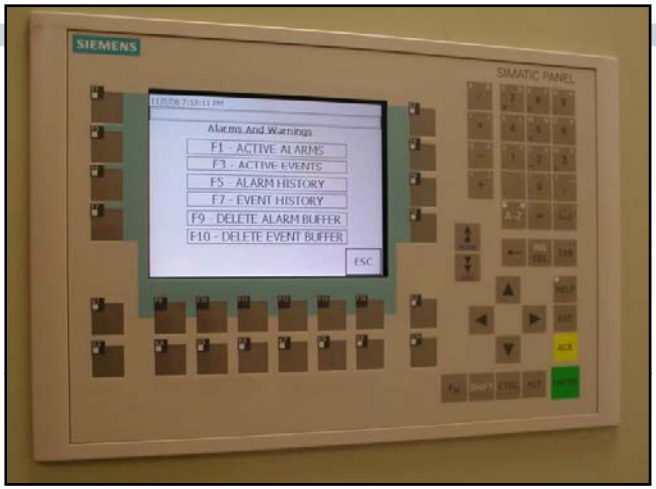
Operator's Cab

Inside Control House



Inside Operator's Cab

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AUTOMATION

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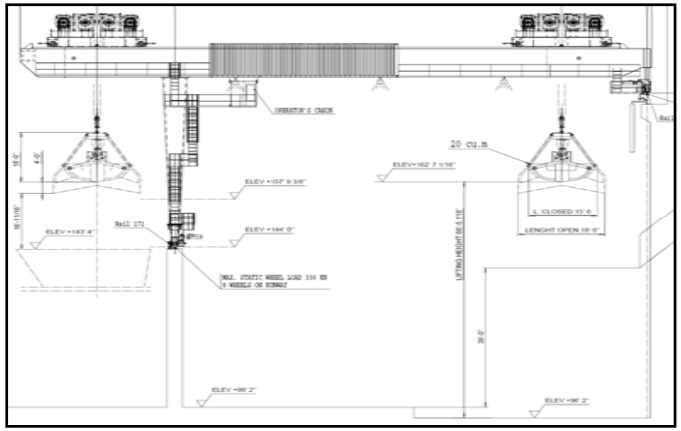
Semi automatic control

- Semi automation is used by operator for moving the grab automatically from the pit to the hopper and back to the pit. Semi automation start/stop control is done with single push button and indication light in the operators cabin pulpit. If the operator touches joystick controller cycle is interrupted.



SAFETY, RELIABILITY, PRODUCTIVITY

AUTOMATION & SAFETY

KONECRANES® Lifting Businesses™

DynaPilot antisway control and zone protection

- Dynapilot, electronic anti sway control, enables overlapping movements of all three motions which makes movements smooth. Dynapilot is utilized in protected zone function to create no-go zones to prevent grab hitting pit walls or separation walls.

SAFETY, RELIABILITY, PRODUCTIVITY

Automation
Semi-automatic Cycle

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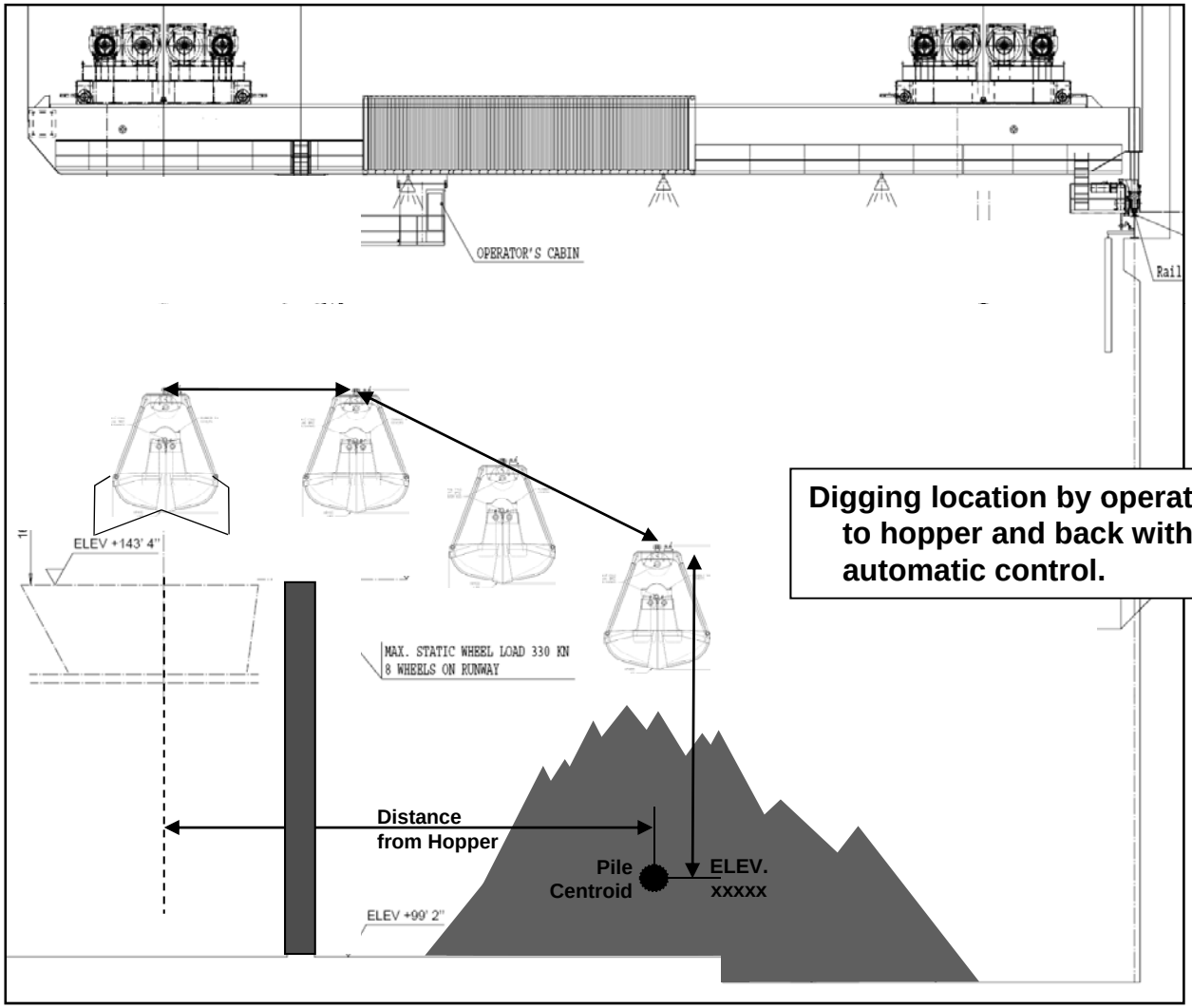
Task:

Automatic Hopper Loading.



Digging location by operator: Travel to hopper and back with semi-automatic control.

On Board Spare Inverters

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DynAReg

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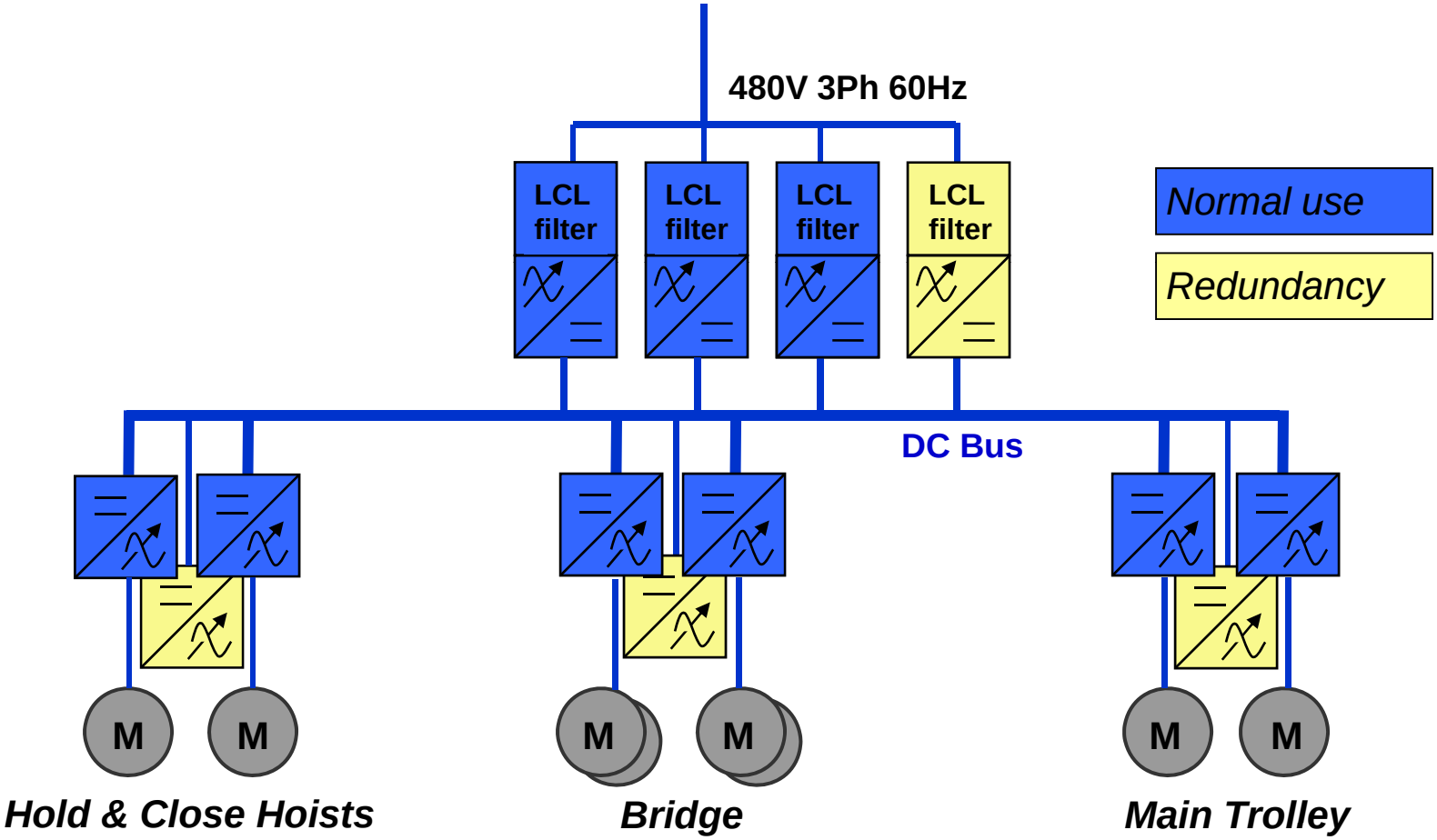
Redundant Drives and DynAReg Modules



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Thank You !

www.konecranes.com

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