



Knowledge Sharing
Workshop - 27/28-Feb-23
Organised by PNGRB & HPCL

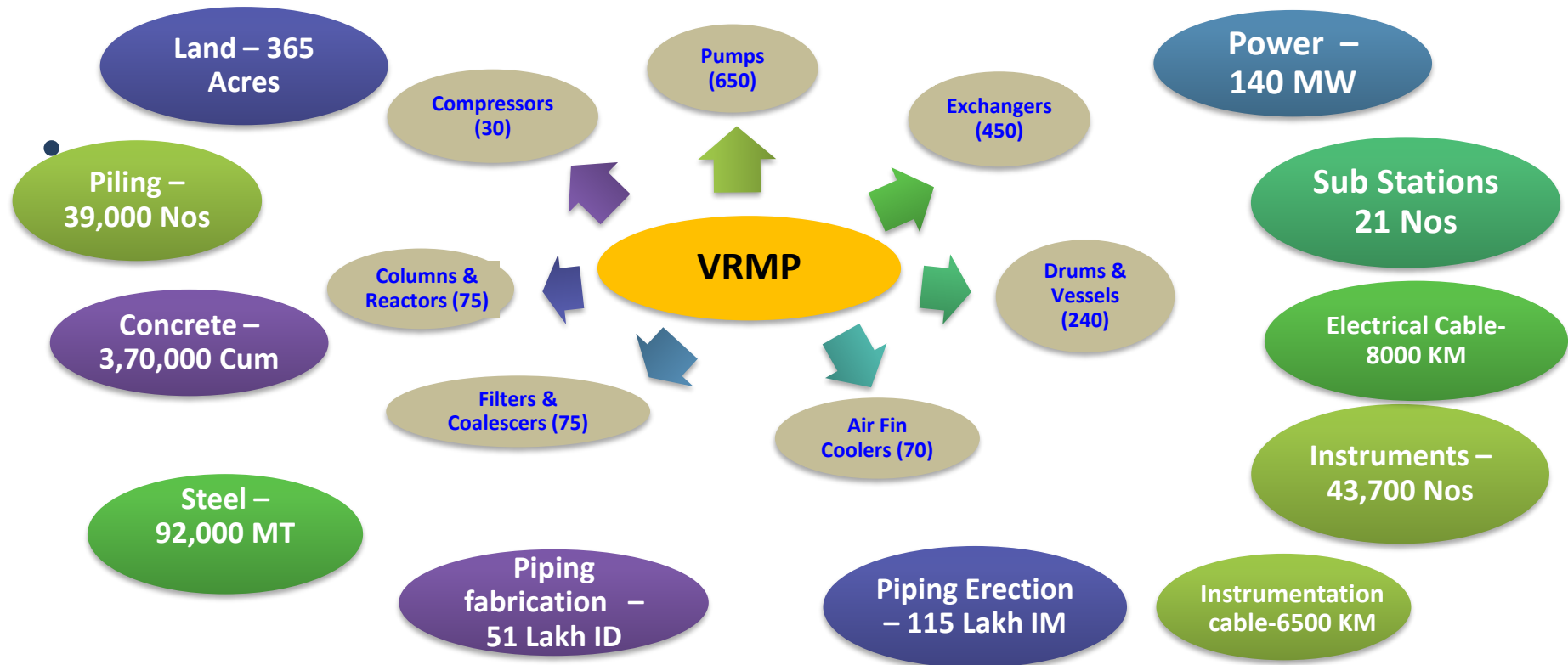


Leveraging Technology & AI in Refinery Project Safety

Trevor S. Guerra
GM – Projects (VRMP)

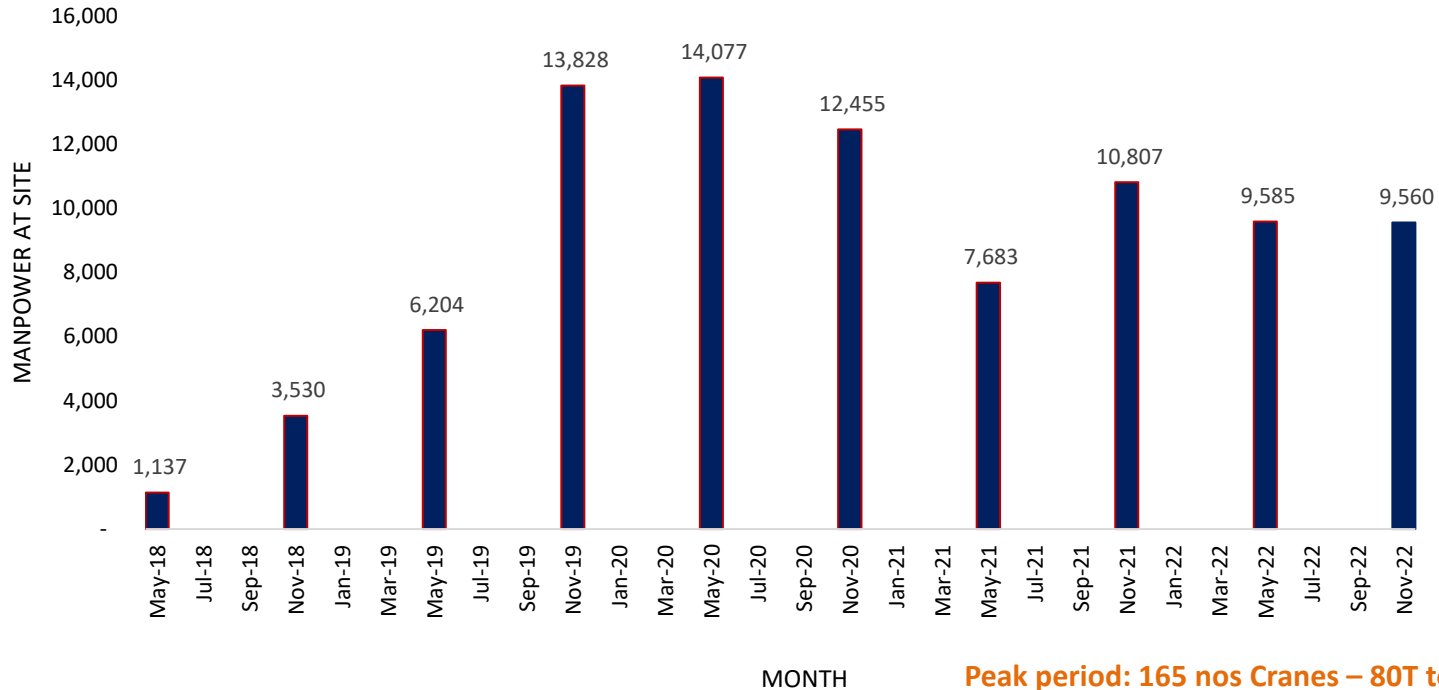


Project Scope





Manpower



Peak period: 165 nos Cranes – 80T to 3,200T



Need for Technology in Construction Safety



Civil works@ 26 m elevation



- ❑ Constrained Working
- ❑ Fatigue
- ❑ Repetitive nature of job
- ❑ Personal bias
- ❑ Industrial relations





Pre-casting



- Involves the casting of pipe racks / civil components off-site
- ✓ Controlled environment
- ✓ Eliminates **Work at height**
- ✓ Reduces on-site work

H Frames – 178 Nos
I Frames – 243 nos

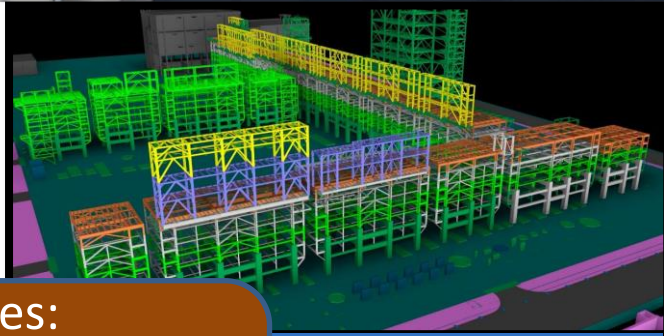




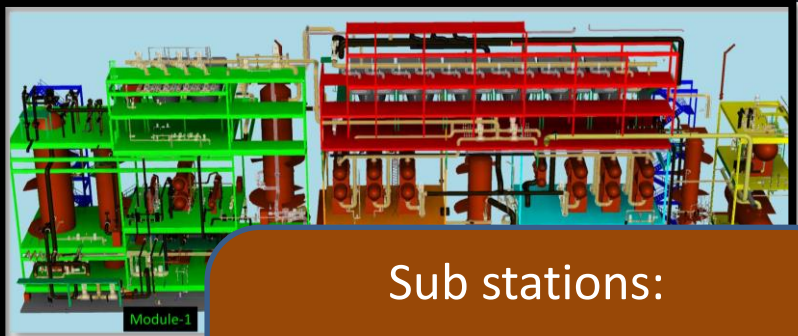
Modular Pre fabrication



MODULARISATION:
AFCs – 59
Tech Structures – 183
Heaters – 39



MODULAR PIPE RACK



RUF : T

Modules:
7Lx4Wx8H – 15MT
32Lx13Wx15H – 660MT

Sub stations:
SS-84 – 3,664 Elements
SS-85 – 1,412 Elements
SS-99 – 822 Elements



RUF : PRECAST PIPERACK MODULE



RUF : PRECAST BUILDING



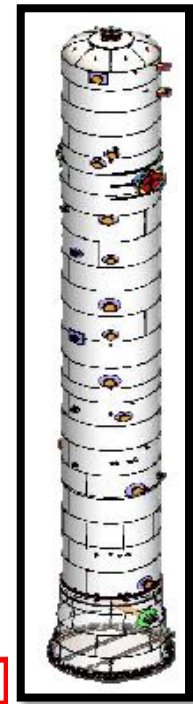
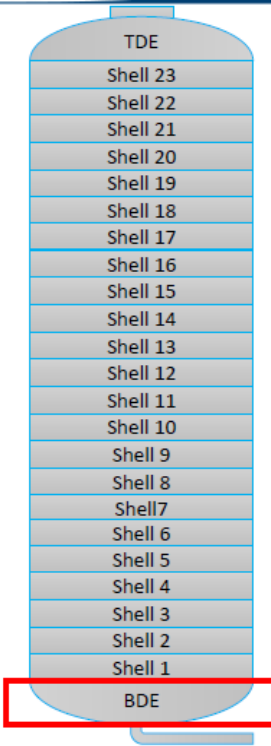
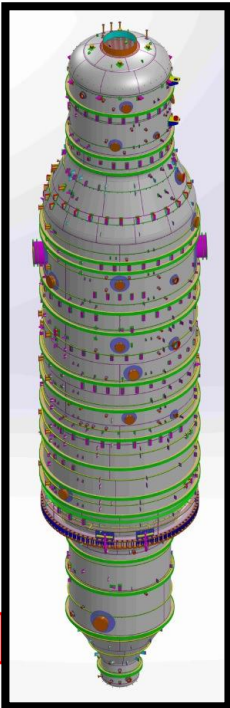
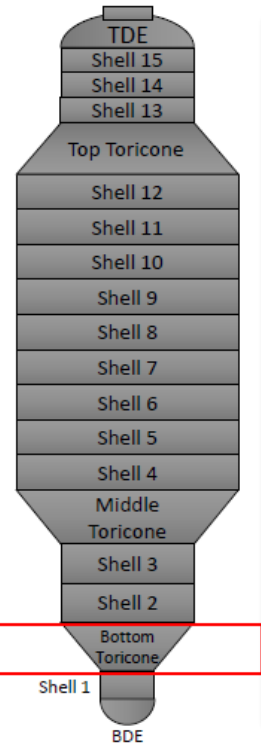
PEB CONSTRUCTION



Receipt of Fully Fabricated Equipment



- ✓ No holding with crane (min. 10 shells/ 15 months)
- ✓ Avoiding working at heights
- ✓ Better quality control - shop vs site





Erecting Major Equipment



Crude column



RUF reactors



FCHCU reactor



Vacuum column



Virtual Reality Trainings



Virtual reality technology can be used to provide realistic and immersive training experiences for refinery work force, allowing them to practice emergency response procedures in a safe and Controlled environment. VR makes complex situations easy to understand



Topics covered:

Module 1: Working at Heights

Module 2: Fall through Cut out Opening

Module 3: Material Fall Activities

Module 4: Vehicle Parked over Slope

Module 5: Working over Ladder

Module 6: Power Tools Operation

Module 7: Use of LOTO System

Module 8: Safe Material Handling

Module 9: Safe Operations of Cranes



Equipment Movement Monitoring



Onsite Equipment and Conveyance
Vehicle Tracking



GPS
Tracking

Monitoring by
Dedicated
Administrator



- Real time speed monitoring
- Alert on Equipment break-down and Stoppage
- Daily trip Monitor
- Monitor from Mobile application

Delay Start Mechanism

Requirement

- ❖ Construction workers nap under vehicles
- ❖ Without checking, if the vehicle is operated, can lead to serious injury / fatal accidents.



Benefits

“If the operator tries to start the ignition, **DSM unit** will not allow to start, until completion of buzzer for 20 seconds”

“This allows sufficient warning for any worker in the vicinity to move clear. Engine will start after pre-set time.

Saves precious human lives





QR Codes for Vehicle Monitoring



Asset Details

Basic Details

Asset Code: 01360980

Asset Description: EXCAVATOR

Owner: Own

Classification: Major

MajorCategory: EARTHMOVING

Acquisition/Hire Date: 2010-09-08


Asset Code: 01360980

Make: L&T KOMATSU


Model Number: PC 300LC-7

OEM Serial Number: 0

Present Location: HRRL, DFCU UHT Site



Scan to get Equipment Details



Asset Description: EXCAVATOR

[Download Label](#)



- Vehicle Registration
- Insurance Certificate
- Fitness Certificate
- Road Tax
- PUC Certificate
- Third Party Inspection
- No-Objection Certificate
- Temporary Road Permit
- Vehicle Gate Pass
- Vehicle/Equipment Client Approval

- P&M Safety Inspection Checklist
- Driver/Operator License
- Driver/Operator Third Party Certificate
- Driver/Operator Civil ID
- Driver/Operator Client Approval
- Driver/Operator Gate Pass





Face Recognition / Biometrics / CCTV



- ❑ Face Recognition is used to identify workers' attendance
 - Attendance Management System at respective location

- ❑ Biometrics are used to identify workers' attendance
 - Attendance Management System at Refinery
 - Attendance Management System at respective location

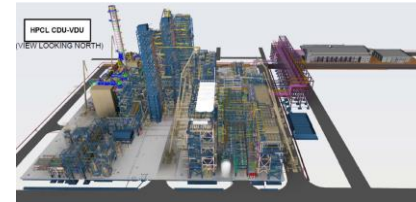
- ❑ CCTV provide real time monitoring of activities at various construction sites, at a central location.
 - ✓ provide early warning of potential safety hazards, allowing to take corrective action quickly.
 - 75+ Cameras with 1 month's recording



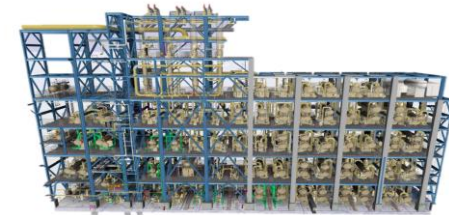
Model Review



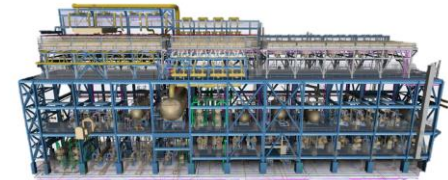
- All Process Units have been modelled in 3 dimensions.
- ✓ Enables finalisation of safe procedures for Construction, Operations and Maintenance



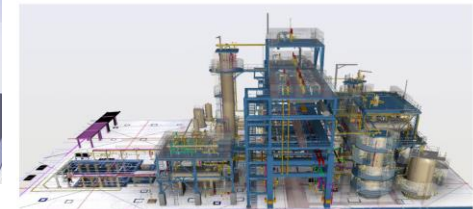
TS-2



TS-1

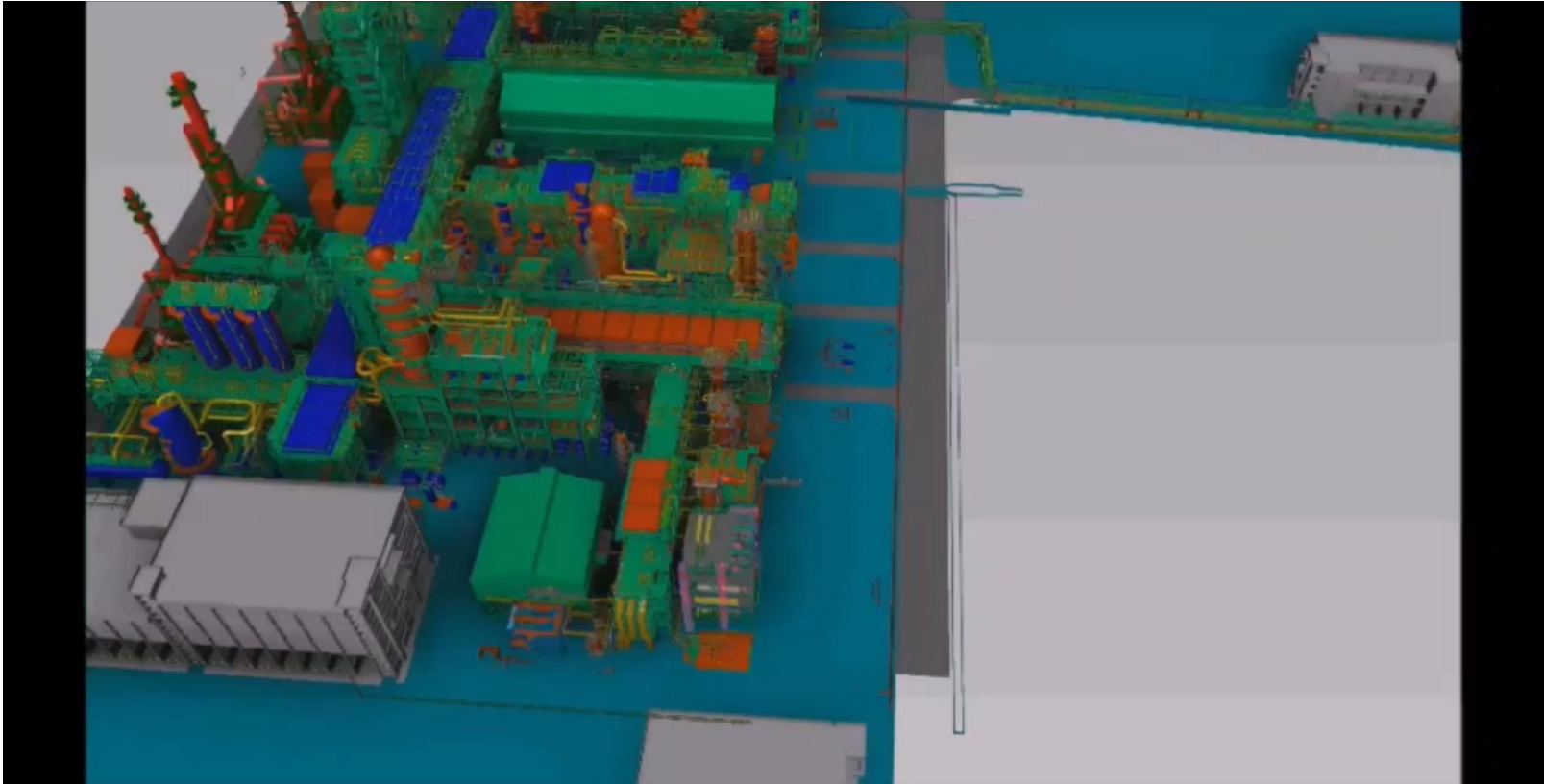


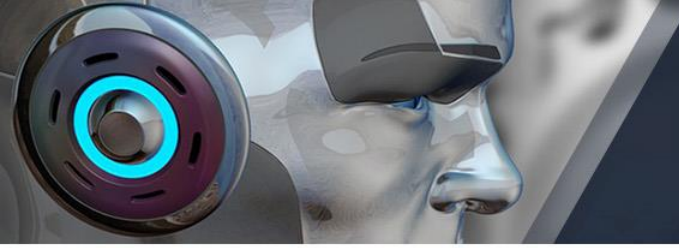
SR LPG Unit





3-D Model of RUF





Automation



- ❑ Concrete boom placer
- ❑ Automatic Rebar bending
- ❑ Automatic Cable Puller
- ❑ CCTV
- ❑ Orbital Welding Machines
- ❑ Automatic Plastering Machine
- ❑ Auto Blasting Machine
- ❑ Digital Radiography
- ❑ Equipment Skidding
- ❑ PAUT



Concrete boom placer



Equipment skidding



Auto plastering machine

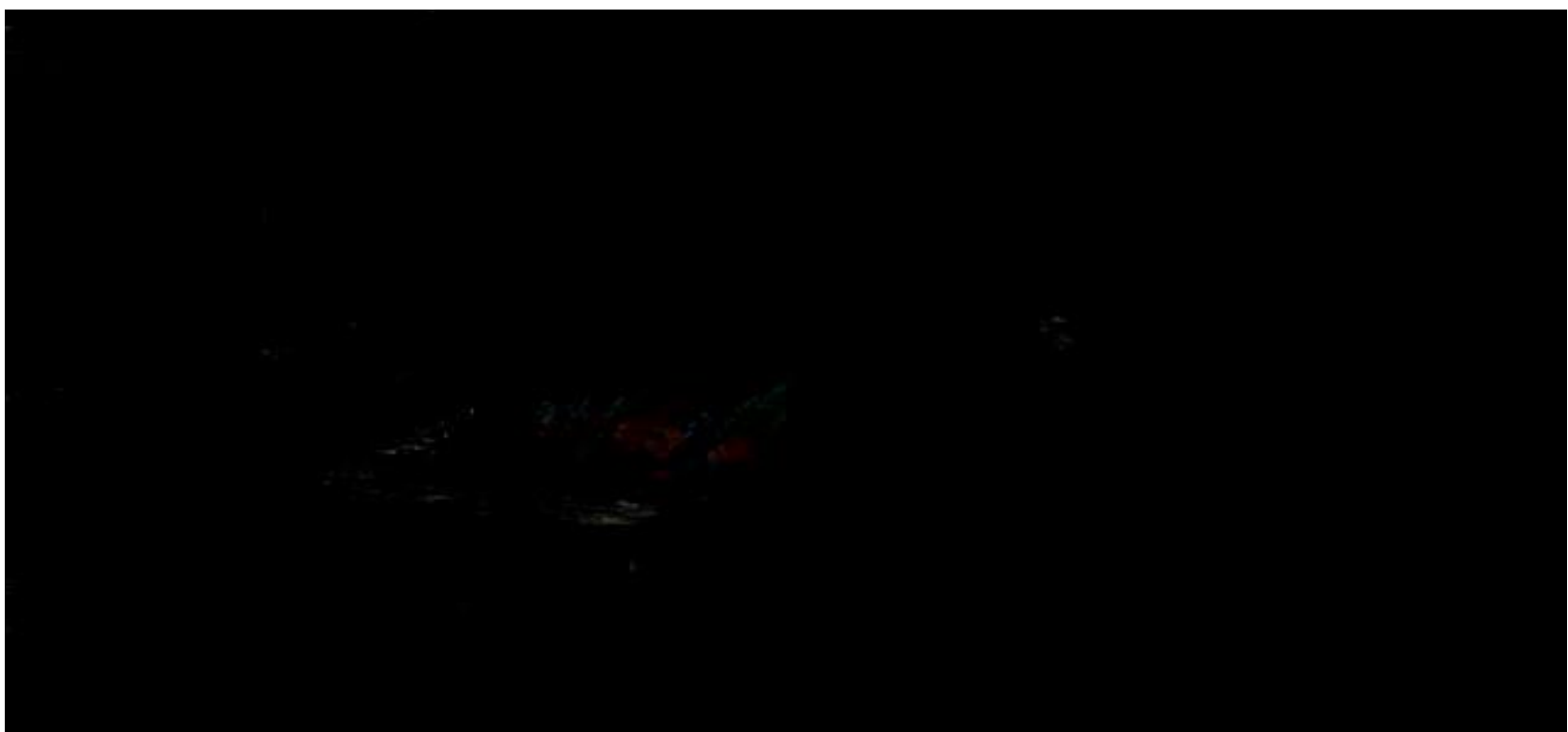


Orbital welding





Automation Rebar Bending





Automated Cable Puller





AI in Construction Safety



- Real time monitoring (analyze data from cameras, drones, sensors and other sources)
- Safety monitoring
- Risk identification
- Incident response
- Predictive Maintenance
- Training

Thank you..!

Trevor S Guerra

