**Problem**

- **Human Safety on Rigs**
  - Over 369 severe injuries reported on US rigs per year
  - Large mental health incidence rates among rig workers
  - Rig working environment is far riskier than an office space

- **Remote Rig Location**
  - Lack of communication between operations teams and management resulting in poor decision making, which:
    - Decreases operational efficiency
    - Minimizes utilization of human resources and skills

**Solution - Data Interconnectivity**

- **Retrofit sensors**
  - Existing sensors on rig replaced with wireless sensors to create an internet of Things (IoT) in cloud:
    - i.e pore pressure sensors, rig floor safety alarms, etc.
  - Sensor data sent to gateway for analyzing

- **Data transported to cloud**
  - Users connect via internet to the cloud to access rig data and manage operations instantaneously
  - Allows for access from servers anywhere on Earth

**Solution - Data Interaction**

- **Remote access using Virtual Reality (VR)**
  - Creates immersive experience utilizing 3D virtual interactive model of rig for user accessibility
  - Users interact with model to perform standard operations and anticipate possible equipment failures based on their work capacity (maintenance, geology, logistics, etc.)

- **Alterations in virtual model communicated to rig**
  - Changes made are reflected on rig in real time

**Solution - Automation**

- **Implement autonomous machinery to manage rig**
  - Robots will enact on instructions sent by remote command centers to evaluate infrastructure integrity and manage drilling proceedings
  - Only 10 workers specializing in different fields will remain on the rig to oversee operations, all others will be relocated onshore
  - All robots fitted with 360 degree 4K cameras which allow users to view live rig footage for surveillance

**Impacts and Cost Benefit Analysis**

- **Improves Human Safety**
  - Relocating people onshore from rig eliminates current health hazards posed by rig working environment reducing risks

- **Operations Connectivity Boosted**
  - Better use of human resources due to enhanced communication with worldwide teams and rig from onshore relocation

- **Decreases Carbon Emissions**
  - Reduced need for helicopter travel limits emissions - 7000 lbs/flight

- **Cost Savings**
  - Implementation cost: $57.5M
  - Automation saves $25.5M/year/rig in efficiency
    - Uses AI for predictive maintenance, reduction in headcount, operation in adverse weather, faster speed than humans
  - Compensation costs for injuries and deaths drastically reduced
  - Likelihood of hydrocarbon loss mitigated due to increased reliability

**Solutions - Analysis**

![Cost-Benefit of the Implementation of Autonomous Rigs](Image)

- Breakeven ~ 2.2 years

**Sources**