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*The* UNIVERSITY *of* OKLAHOMA

# **Automated Directional Drilling**

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Emmanuel Akita

Forrest Dyer

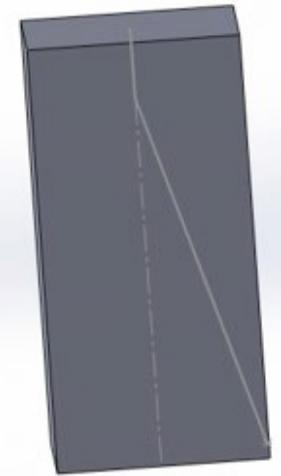
Dr. Ramadan Ahmed

# Highlights

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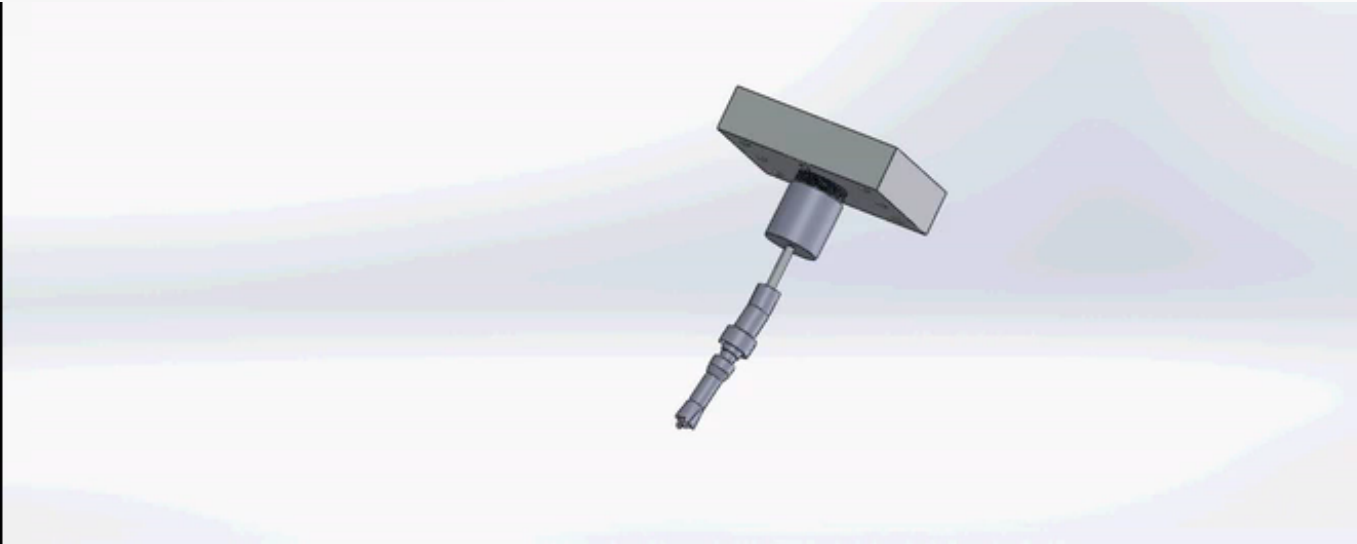


- **Directional automation – access more area**
- **Downhole sensor feedback loop in controls**
- **Sensor redundancies**
- **Cable drilling applied to straight wells**
- **Power constraints, WOB restrictions**



# Design Concept

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# Thank you

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## VIII. Acknowledgements

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- Mewbourne Oil Corporation
- Jeff McCaskill
- Jack Borer







# 2019 Team Members

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- Emmanuel Akita
- Forrest Dyer
- Payton Duggan
- Savanna Drummond
- Monica Elkins
- Dr. Ramadan Ahmed

Team Captain  
Mechanical/Machinist  
Electrical  
General Logistics  
General Logistics  
Advising Professor

➤ VimleshBavadiya      Advising Liason



# Presentation Outline

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- I. 2018 Recap
- II. 2019 Design Concept
- III. 2019 Improvements
- IV. Mechanical Systems
- V. Electrical Systems
- VI. Control System
- VII. Capital Expenditures
- VIII. Acknowledgements

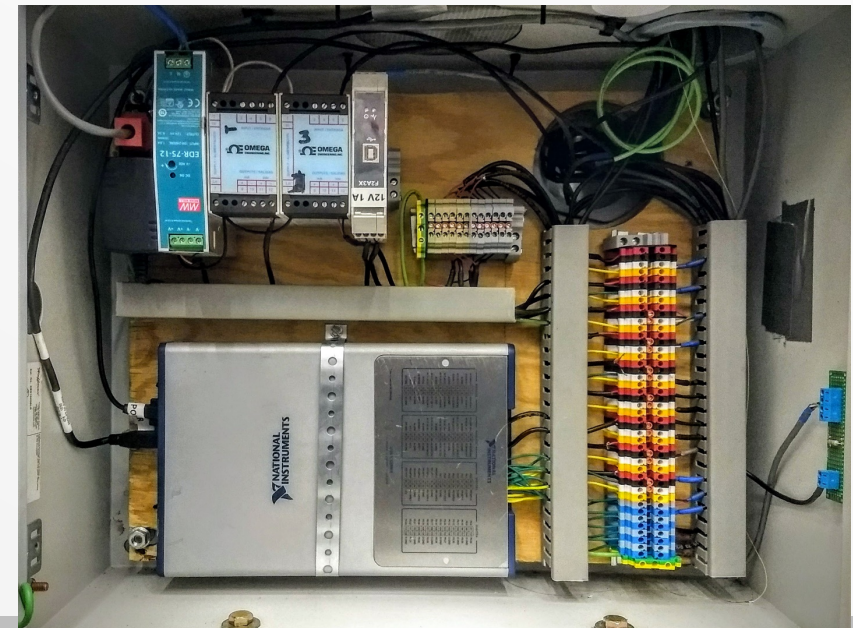
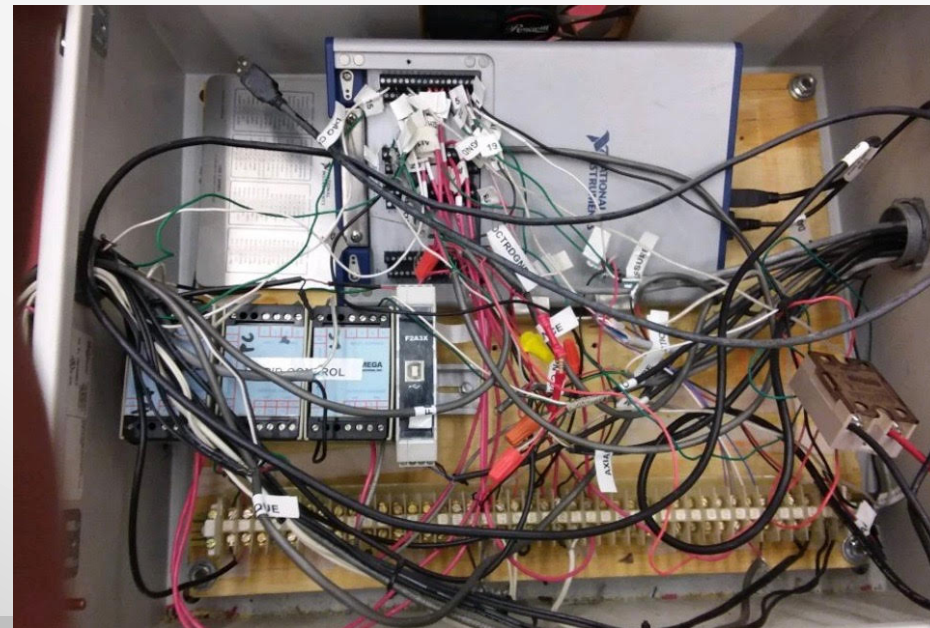


# I. 2018 Recap

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## Major improvements

- Electrical System
- Pneumatic System





## II. 2019 Design Concept

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### **4 major system designs**

- Rotation
- Circulation
- Weight on Bit
- Directional



## II. 2019 Design Concept

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### **Rotation: Transfer Power to the Bit**

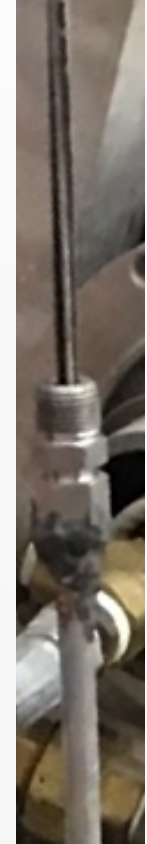
- Cable Drilling
- Special Connections

### **Circulation:**

- Flow between cable and pipe

### **Weight on Bit:**

- Mainly transferred by drill pipe







## II. 2019 Design Concept

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### **Directional Drilling Assembly**

- Downhole Sensor
- Stepper Motor
- New BHA





## II. 2019 Design Concept

### New Bottom Hole Assembly

- Bent Sub
- Roughly 12°





# III. 2019 Improvements

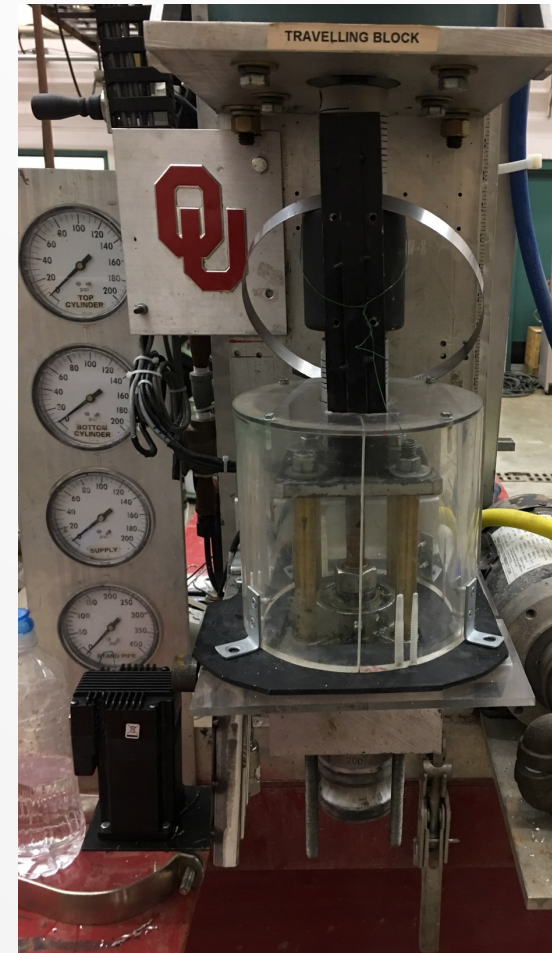
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## Swivel Removed

- Bypass to camlock connection

## Safety Measures

- Enclosed rotating parts





## IV. Mechanical Systems

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### **NewTopDrive**

- Max RPM-1800

### **Camlock Assembly**

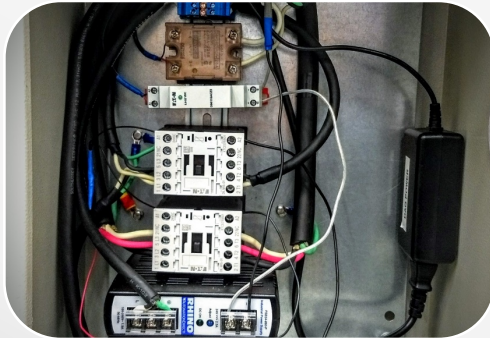
- Quick Disconnect



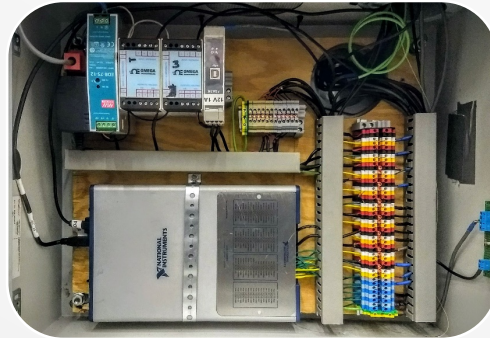


# V. Electrical Systems

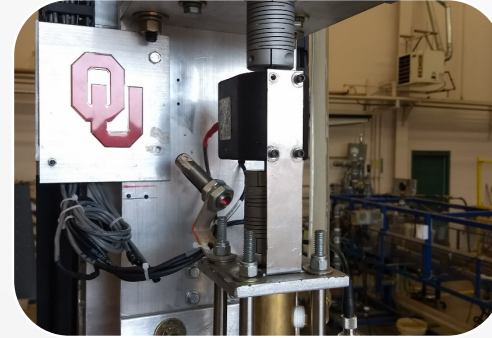
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Power System  
and Control



Data  
Acquisition



Rig Sensors



Downhole  
Sensor



# VI. Control Systems

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# VII. Capital Expenditures



Category	Expenditures
Big Ticket Improvement	\$5,793
Parts/Materials	\$3,012
Safety	\$297
Miscellaneous	\$437
<b>TOTAL</b>	<b>\$9,537</b>





Trial and Error





Trial and Error