



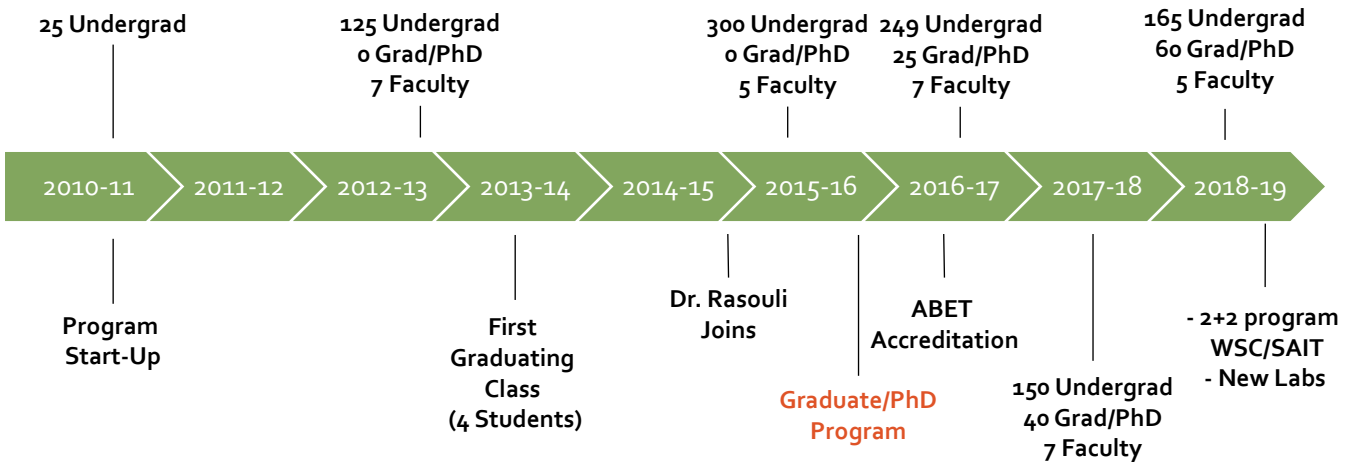
## **NDIC Funding to Support Research of Petroleum Engineering Program at University of North Dakota**

**“Contract ID. G-51-02”**

**Dr. Vamegh Rasouli**  
Department Chair, Continental Resources Distinguished Professor

December 2019

# History of UND Petroleum Engineering



# Objectives of This Proposal

Hands on & Practical  
Petroleum Engineers to Work  
in ND Petroleum Industry

Education

Conduct research to  
address the immediate  
industry problems and  
develop future  
technologies in Bakken

Practical  
Research

UND  
PE

Industry  
Collaboration  
& Services

Use PE resources  
including labs to do  
regular experiments and  
field scale simulations  
addressing specific  
operational problems

## Industry Advisory Council (IAC)



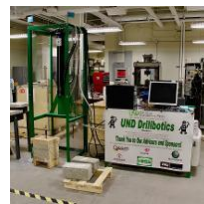
# Current Labs



Auto Lab 1500 Multi-purpose Test System



DrillSIM-5000 'conventional' drilling simulator



Automated Drilling Rig



Cuttings transportation and hole cleaning design



Uniaxial Compressive Strength



Virtual Reality



Interfacial Tension



Multiphase Flow Loop Lab



Pipeline Fluid Flow Simulation Lab



Core Flooding System

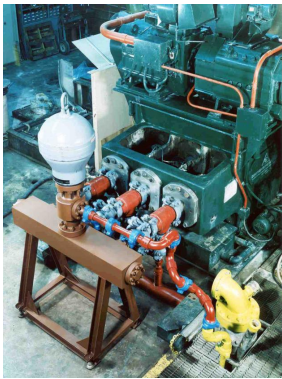
# Full-Scale Reservoir Simulated Drilling and Completions Laboratory

Donation by

**Sidney Green**

President of Enhanced Production, Inc. a Utah corporation,  
and is Research Professor at the University of Utah





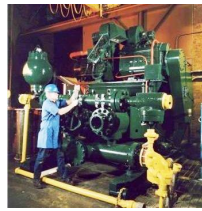
Fluid Ends



Drill Sample



Sand Screen Test



1600 Triplex Mud Pump



Thyristor Controls for Mud Pump



Coring Samples

Drill Tower



Rotary Table



Mud Tanks



Mud System



Electrical Controls



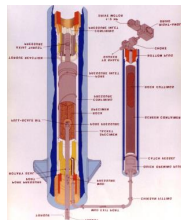
Test Rock Samples



Coring Samples



Control Room



Wellbore Simulator & Chock

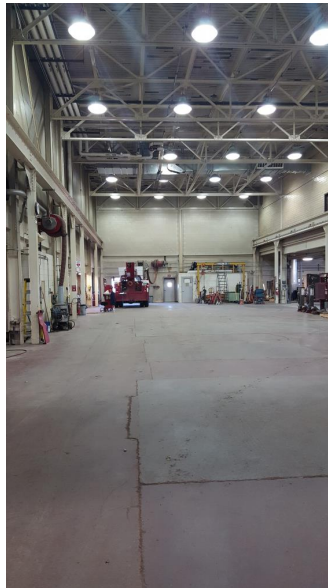


Pipe Transformers

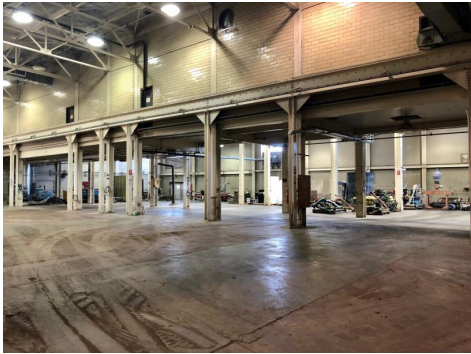
## New Home for the Drilling Rig



- Old Minnkota Power Plant, Grand Forks
- 17,000sqf space & Full Basement
- Rented @ \$5,000/month



# New Home for the Drilling Rig





# New Home for the Drilling Rig



## **What Opportunities the New Labs Offer?**

- Accessible to students and others at anytime
- Used for teaching purposes in several courses and demonstration to students
- Equipment can be used as training resources (pumps, compressors etc)
- Can be modified towards any specific research projects
- One of the few lab with capability of 20,000psi pressure application
- Usable for different industry services (sampling, drilling, bit testing etc)
- Enhances the chance for collaboration with other Universities and research institutes
- Strengthen our research proposal submission
- Promotes department's visibility and ranking worldwide

## **Current Fund Status**

- A total of \$600,000 was approved for UND Department of Petroleum Engineering to support its research program. The fund was approved to be spent towards Ph.D. students' stipends and tuition as well as faculty summer salary. The grant started on Sept 1, 2018 for a period of 18 months.
- At least 9 students to be supported from this grant. In addition the department agreed to support 6 additional students to work on the projects related to this funding.
- At a minimum the following projects agreed to be completed by the students/faculty:
  - Big Data Analytics/UAS/Data Mining
  - CO2-EOR
  - Sulfate Deposition
  - Machine Learning/Refracking

## **Impacts of the Funding**

- Over 90 publications and 60 travels to conferences and workshops
- 10 PhD graduates so far, most of them working at the EERC
- Supporting Undergrad program
- Big advertisement for the program

# **Request for New Funding**

**“Contract ID. G-51-02”**

## 1. Tuition and Stipend of Ph.D. Students

Approximate costs of a Ph.D. student per annum

<b>Tuition</b>	<b>\$15,000</b>
Stipend	\$15,000
PC & Office Supply	\$1,000
Travel to Conferences, Workshops	\$1,000
Lab Material, Supply, Maintenance etc for lab based projects	\$2,000
<b>Total per student per year</b>	<b>\$34,000</b>
<b>Total for 15 students per year</b>	<b>\$510,000</b>

## **2. Faculty Summer Salary**

- Including fringes and benefits varies between \$15,000 and \$19,000 monthly for Assistant to Full Professor positions. Average of \$16,000.
- We request one month of summer salary per annum for 6 faculty members, a total of **\$96,000**.

### **3. NDIC Endowed Faculty Hiring**

- An Associate Professor hiring for a total annual package (salary & benefits) of **\$140,000**.



## 4. New Lab Set Up

Items	Year 1	Year 2	Year 3	Total
Lab Manager Salary including benefits	150,000	150,000	150,000	450,000
Consulting Fees	50,000	10,000	10,000	70,000
Equipment Upgrade	300,000	50,000	20,000	370,000
Lab Supplies	100,000	50,000	50,000	200,000
Lab Maintenance	50,000	50,000	50,000	150,000
Initial lab set up	150,000			150,000
Subcontractors	100,000			100,000
<b>Total</b>	<b>900,000</b>	<b>310,000</b>	<b>280,000</b>	<b>1,490,000</b>



**Harry Feilen**  
 Currently Mgr  
 Operations &  
 Safety – IES  
 Strong candidate  
 for PE Lab Mgr  
 Position



**Alan Black**  
 Former general  
 manager of  
 TerraTek's Drilling  
 and Completion  
 Laboratory



**Sidney Green**

**Gee Green**

## Total Funding Request for 3 Years Period

<b>Item</b>	<b>Total (\$)</b>
15 Ph.D. students tuition & stipend	1,530,000
6 faculty summer salaries	288,000
One Associate Professor Endowed Position	420,000
Full-Scale Reservoir Simulated Drilling and Completions Labs	<b>1,490,000</b>
<b>Total</b>	<b>3,728,000</b>

# Cost Share

Company	Total (\$)
Itasca Consulting Group, software donation & Technical Advice	1,269,150
SimTech, software donation & Technical Advice	715,000
Sid Green Four, LLC, technical advice, data sharing and donation of equipment	2,000,000
<b>Total</b>	<b>3,984,150</b>

## Total Project Costs

Item	Total for 3 Years(\$)
NDIC Funding Request	3,728,000
Cost Share	3,984,150
<b>TOTAL</b>	<b>7,712,150</b>

**Questions?**