AMISH, M. 2022. *Developing a virtual engineering lab using ADDIE model*. Presented at the 2022 RGU annual learning and teaching conference (RGU LTC 2022): enhancing for impact, 21 October 2022, Aberdeen, UK.

Developing a virtual engineering lab using ADDIE model.

AMISH, M.

2022

Developing a Virtual Engineering Lab Using ADDIE Model

1. Engineering Education Challenges

Changes in technological awareness amongst the "digital generation" are driving a trend towards the seamless integration of technology into the traditional learning environment. The use of technology can facilitate communication, assess learning activities, as well as create high-quality learning materials. Over the next few years, there will be a rapid growth of engineers with employability and digital skills. To meet this demand, it is essential to develop high quality virtual tools to deliver attractive student programmes that:

- Address the limitations of hands-on laboratories
- Take advantages of globalisation
- Stimulate the uptake of engineering by students
- Deliver employment driven programmes
- Offer the best learning environment to support "in-person" programmes
- Meet the growing expectation for seamless technological integration.

2. Project Scope

To develop a complete learning management product that will:

- Provide access to labs in various disciplines of Engineering
- Contribute to the effective enhancement of teaching and learning

3. How will this help?

- Develop knowledge, soft skills and digital skills that meet the needs of today's job market.
- Provides a change to engineering education and work practice.
- Supporting inclusive, seamless and off-campus learning
- Enhance collaborative teaching and learning support
- Reduce demands on infrastructure
- Share the cost of facilities and resources
- Improve student preparation for physical laboratories
- Allows students to learn in their own time
- Better retention of knowledge - repetition of lab activities
- Integration of assessment for learning and feedback elements
- Enhancing the experiential learning experience
- Increasing access to HE.

4. Going Forward

Build technical and pedagogical methodologies

School of Engineering Laboratories

Electrical Engineering

Mechanical Engineering

Oil and Gas Engineering

Hydraulics Design	
Velocity IDP, ft/sec	8
Velocity IDC, ft/sec	23
Apparent Viscosity IDP, cP	30
Reynolds Number IDP	14166
Friction Factor, f	0
Pressure Drop IDP, psi	235
Apparent Viscosity IDC, cP	11
Reynolds Number IDC	77478
Friction Factor, f	0
Pressure Drop IDC, psi	177
Velocity ODP, ft/sec	3
Velocity ODC, ft/sec	5
Apparent Viscosity ODC, cP	16
Reynolds Number ODC	797
Laminar Flow	
Pressure Drop ODC, psi	88
Apparent Viscosity ODP, cP	34
Reynolds Number ODP	487
Laminar Flow	
Pressure Drop ADP, psi	329
Across the bit	1331
SURFACE PL, psi	30
PL ID DP&DC, psi	412
PL AN DC&DP, psi	417
Total PL, psi	2190
ECD, ppg	14
BHP, psi	6163
HHP	447
Maximum hydraulic horsepower	0.61

Simulator

Drilling parameters	
Hole Siza, in	8.5
Flow Rate, gpm	350
Mud Weight, ppg	13
Depth, ft	8500
DP Length, ft	7900
DP OD, in	5
DP ID, in	4.27
DC Length, ft	600
DC OD, ft	6.5
DC ID, ft	2.5

Viscometer Readings

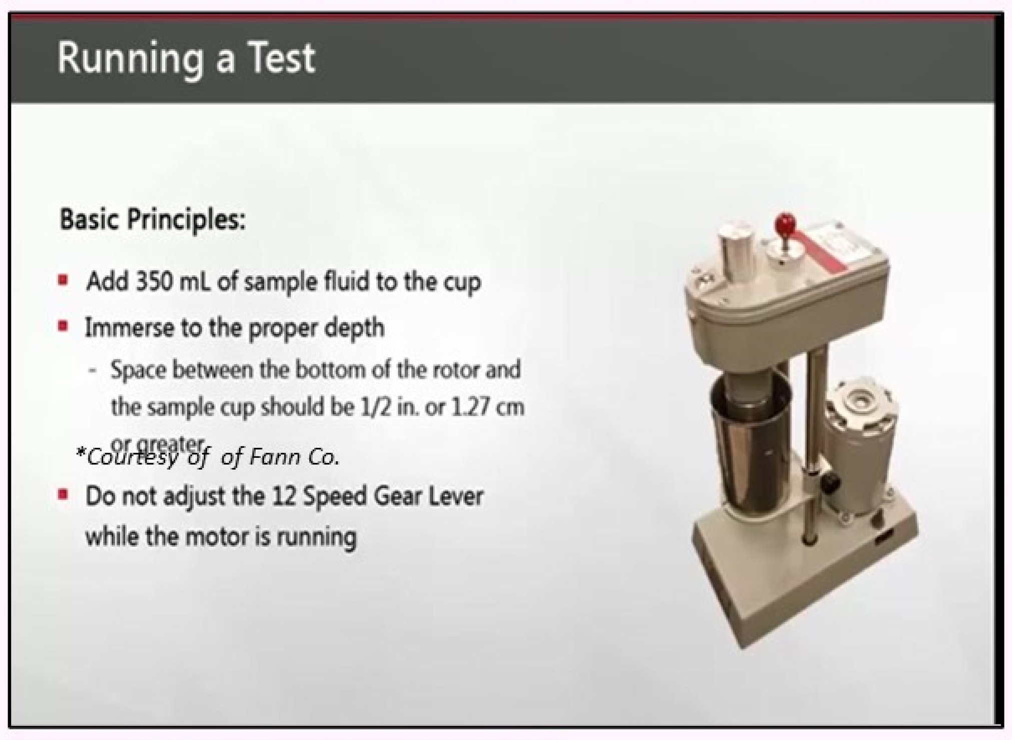
6-speed Readings

RPM	Reading
600	61.00
300	40.00
200	30.00
100	21.00
6	10.00
3	9.00

OK

RHEOLOGICAL PARAMETERS		
Bingham plastic		
Plastic viscosity	28	cP
Yield point	51	lb/100ft^2
Power Law	Rheology of Mud A	
Flow behaviour, n	**0.409**	-
Consistency Index, K	**3147**	cP
Herschel-Bulkley		
True yield	35.77	dyne/cm^2
Flow behaviour, n	0.579	-
Consistency Index, K	994	cP

Assignment



Theory and Procedure

Experiment demo

- List of Experiments
- Theory
- Procedure
- Demo
- Simulator
- Assignment
- Feedback
- Staff Support

Analysis → Design → Development → Implementation → Piloting → Evaluation → Reflection

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