IADC DEC Q4 2024 Tech Forum, "Enabling New Energies"

Tuesday, 5 November, 8:30am-12:00pm
*Venue: **RelyOn**, 15621 Blue Ash Dr #150, Houston, TX 77090*

The IADC Drilling Engineers Committee (DEC) will hold its Q4 technology forum on Enabling New Energy – geothermal, hydrogen, lithium mining, and other energy activities use drilling and wells in their value streams. This forum will explore the question of, "How does drilling engineering provides value in new energy segments?"

New energy's emerging applications require new approaches to well design and drilling technology to meet economic requirements, and drilling engineers are stepping up to the challenge. This forum will highlight well construction projects in this space, cover the drilling engineering and technology in the field today, and explore future needs. The types of applications include geothermal resources, geologic hydrogen, lithium brine mining, helium extraction, CO2 storage, and saltwater disposal. Progress in everything from designing the well to operational practice will be considered.

Questions to consider:

- For each specific energy application, how could we be designing and delivering wells considering their operational life cycle?
- What engineering considerations, well designs, drilling rig equipment are needed for alternative energy applications?
- What industry groups are out there? How do I get involved?
- How do we repurpose our current skill sets and technologies to support alternative energy?
- How do we design training for new engineers to be adaptive and inclusive of new energies in the future? What are the key differences? Similarities?

Special thanks to our event host RelyOn!

Agenda

08.40-09.10 "**The IADC Geothermal Committee: Enabling New Energy with Geothermal Drilling Standards,"** Shaun Toralde, Vice-Chair, IADC Geothermal Committee View Presentation View Video Recording

The International Association of Drilling Contractors (IADC) Geothermal Committee aims to enhance the pivotal role of the drilling industry in expediting geothermal energy development. Serving as a forum and bridge for industry practitioners, it seeks to ensure a safe, sustainable, and efficient model of well construction for the geothermal sector to provide renewable, stable, and affordable energy anywhere in the world.

In the work leading up to the IADC Geothermal Committee's formation, several companies and trade organizations have identified guidelines and standards as a major gap. Hence, in line with the intention of enabling new energy with geothermal drilling standards, the committee's first project is the IADC Geothermal Well Drilling Guidelines, which includes an IADC Classification

for Geothermal Well Types. The code will allow a common understanding of geothermal well types and bridges the gap between the geothermal industry, well construction practitioners (drilling contractors and service companies), and the investment community. It will be established as an international code and seek the endorsement of Geothermal industry bodies such as Geothermal Rising, IGA, and EGEC. The practical terms of the code will form the basis for the remainder of the well drilling guideline, covering topics such as well design, rig and equipment selection, well control, and safety. The presentation will provide an update on the work that the committee has done on the subject.

09.10-09.40 **"EGS SHR Challenges,"** Hani Ibrahim, Masama Energy

The geothermal novel well design of the Engineered Geothermal System (EGS) in the Super Hot Rock (SHR) necessitate deployment of high temperature tolerant tools and techniques.
With a higher well life cycle and required durability of the well' tangible components, additional constraints has to be applied to the well construction and to the execution of the operations to account for the unique characteristics of the EGS SHR. The design of casing although appear to be similar in ways to the traditional oilfield standard albeit more safety factors applied. The downhole tools usage is limited due to the high temperature environment, eliminating almost all necessary tools from usage to achieve the sought directional profiles. Foremost, are the additional safety measures for the Rigsite personnel from exposure to elevated temperatures and increased injuries.
A dominant aspect of this new-gen energy is the repurposing of the existing skills and technologies. The oilfield drilling engineers can extrapolate the benefits of any tool or technique available for the energy industry to the new-gen energy well construction.
Not to minimize the paramount role of innovation in this effort, it is a necessary step, but the research and development cycle may require funding support of multiple resources.

09.40-10.10 **"The Case for Cased-Hole Geothermal: A Solution for Safe and Efficient Ground Source Heat Pump Systems,"** Adam Hollis, IPT Well Solutions View Presentation

This paper explores the integration of cased-hole geothermal systems into building HVAC systems, presenting a solution for addressing methane leaks associated with drilling into oil and gas source rocks or areas such as former landfills or reclaimed swamps with biogenic methane sources. Through the lens of a case study involving geothermal holes drilled into the Mancos shale outcrop, we examine the risks of methane leakage in uncased geothermal wells and argue that a cased-hole approach, coupled with API cement technologies enhanced with thermal conductivity additives, can mitigate these risks. The use of casings, specifically 4-1/2" or 5-1/2" OD casings with thermally conductive cement, offers a viable solution for both environmental protection and efficient heat transfer in ground source heat pump systems. This paper proposes a standardized approach to geothermal drilling and casing practices, potentially revolutionizing safety standards and performance in geothermal HVAC applications.

10.10-10.30 **Networking break**

10.30-11.00 **"New Drilling Challenges related to Offshore Carbon and Hydrogen Operations,"** Zachary Bruton, Noble Corp

I would like to present on two specific new energy markets that I am spearheading for Noble Drilling - carbon storage and hydrogen. For each new market I'll walk through the external drivers leading our industry to it, highlight the challenges in drilling into these new elements and share relevant experience Noble has in working with them.

For carbon storage, Noble already has first hand experience aiding a North Sea Operator in storing nearly 5,000 tonnes of CO2 as part of Project Greensand. We are now working through the technical challenges of de-risking operations once there is pressurized CO2 downhole i.e. workovers on CO2 injection wells, drilling new injection wells after CO2 has been stored, and drilling relief wells.

Our work in hydrogen is more theoretical but I can highlight some of thoughts on what the potential challenges will be.

The aim for the presentation is to help the audience visualize these new energy ecosystems that are developing and the potential needs the markets will soon demand from equipment, processes, and drilling engineers like ourselves.

11.00-11.30 "A single wellbore geothermal energy conversion system using downhole heat exchanger with zero mass withdrawal (ZMW) concept," Mayank Tyagi, Louisiana State University View Presentation View Video Recording

A traditional way of geothermal energy production implies hot brine extraction from the reservoir to a surface facility. This method is economically profitable only for high enthalpy reservoirs associated with shallow depths and high temperatures. The low enthalpy geothermal (LEG) projects are out of consideration due to the high cost of produced electric power related to expensive drilling, cost of the binary cycle system, and long-term installation cost. This paper presents a new zero mass extraction method utilizing downhole heat exchanger (DHE) with no geo-fluid production to the surface. The well design stays as a single horizontal well with coupled production and injection sections. The brine pump is located between the sections providing hot brine circulation through the DHE. The coupled fluid flow and heat transfer mathematical model was developed and simulated using nodal analysis method. The LEG reservoir prototype located in South Louisiana was used to study several cases of the DHE lengths, inclination angles, reservoir permeabilities, and flow rates optimization.

11.30-12.00 "Technology Keystones: Mainstreaming MWD and Rotary Steerables for New HT Geothermal Development," Robert Estes

Geothermal field production improves, as with petroleum fields, when well placement maximizes the surface area that is exposed to the optimal target resource. Whether the reservoir is hydrocarbon-bearing rock or heat-bearing rock, there are common objectives. The goal is usually to get the largest possible production pipe into the perfect location near this resource, over the longest section, and delivering the highest flow rate.

Oilfield drilling technologies like Measurement While Drilling (MWD) and Rotary Steerable Systems (RSS) can enable long lateral sections and complex multiple-well deployments, which require precision wellbore positioning. Enhanced (EGS) and Advanced (AGS) Geothermal Systems require accurate placement of long, smooth wellbores, often in close, parallel

proximity. EGS fracture networks must intersect both injector and producer wells, so the inter-well spacing must be precisely controlled. AGS is often based on intersecting two or more wellbores at depth - a difficult positioning task even in shallow, low-temp formations. Drilling with MWD and RSS can optimize these geothermal multi-well developments, if the tools can be ruggedized for high temperature (HT), hard rock environments.

But common availability of reliable HT MWD and RSS oilfield drilling tools took decades to reach 200°C. Maximum tool operating temperature rose in incremental steps of 25°C, taking nearly 10 years to mature a fleet of tools for each increase in capability. There are several weak links, when it comes to geothermal conditions, in these drilling tools.

So consider: "How can we leapfrog quickly to 300°C for geothermal development?"

12.00 Light lunch, provided by RelyOn