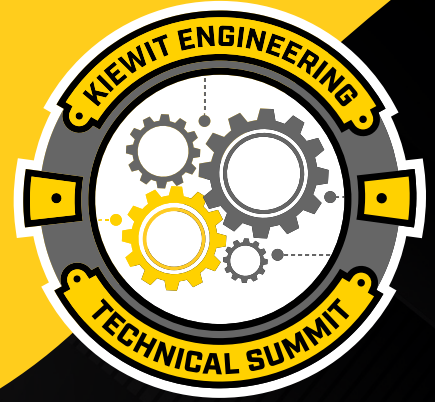


KIEWIT ENGINEERING

TECHNICAL SUMMIT

SPONSORED BY KIEWIT'S CHIEF ENGINEERS COUNCIL



2025

ABSTRACTS

PRESENTATIONS FOR FEBRUARY 18, 2025

CHIEF ENGINEERS PANEL: EARLY CAREER ROUNDTABLE

OSCAR ANATOMMATTEI, JASON MANNING, DEL SHANNON, RORY CARVAJAL, SARAH CHEKRI, SETH DIBBLE, JACOB FRENCH, THAO NGUYEN, JOCELYN TSAI, JAY WEGNER

10:00 AM – 11:00 AM

This group discussion between Chief Engineers and Young Professionals provides a variety of different perspectives and diverse experiences about their engineering careers paths and professional opportunities in Kiewit.

3D MODELING UNLEASHED – THE NEW CORNERSTONE OF CONSTRUCTION

DAVID CHAMBERLAIN, JESSE BARTON, NATE HOWARD

11:15 AM – 12:15 PM

The 3D model has become an essential tool for design and construction, playing a crucial role in validating design quality, performing constructability reviews, and enabling semi-autonomous machine control, as seen in the Southeast Connector Project. As modeling capabilities expand, the demand for high-quality digital data increases, raising questions about design ownership and the potential for models to serve as primary deliverables. The future of highway infrastructure models lies in seamlessly conveying information between engineering and construction, integrating metadata, and potentially incorporating augmented reality.

RE-THINKING PLANT CAPACITY AND DESIGN CONDITIONS IN EMERGING MARKETS

BRYAN LOFGREEN, ERIC EISENBARTH

11:15 AM – 12:15 PM

This presentation explores the impact of innovative project finance models on plant design in emerging markets like carbon capture and hydrogen production. It focuses on a Kiewit case study optimizing ambient conditions for carbon capture projects, balancing capital costs with operational efficiency, and addressing the complexities of multiple revenue streams. The goal is to provide guidance for designers and project managers navigating the interplay between finance and engineering.

KIEWIT'S FUTURE WITH PERFORMANCE-BASED DESIGN: A STRUCTURAL CASE STUDY

KORY RANKIN

12:30 PM – 1:30 PM

Since 2020, Kiewit's solar team has developed advanced structural design tools, including Performance-Based Design (PBD) for steel piles, to enhance competitiveness and constructability. In 2024, Kiewit implemented the first (known) performance-based design for solar piles in the US to explicitly quantify risk and reliability. Codes and standards often cannot apply directly to special design requirements or project needs, so accordingly they encourage innovative solutions like PBD as long as a commensurate level of rigor and independent review is implemented. Years of collaboration, refinement, and validation in the solar group have positioned Kiewit and its clients to leverage flexible, economical, and risk-targeted solutions with direct application to other disciplines and markets.

HOW TO VENT HYDROGEN AND OXYGEN SAFELY

JINHWAN YOO, SANJAY GANJAM, PAULO FERNANDEZ

12:30 PM – 1:30 PM

In hydrogen production systems, venting hydrogen and oxygen is crucial to prevent pressure build-up during emergency conditions. This presentation will discuss safe venting practices, recommended models, and analysis methods for vapor dispersion and stack height determination, ensuring inherently safe plant designs from the project's start.

THE USE OF SEAWATER FOR INDUSTRIAL WATER MAKE-UP

BERNARDO RODRIGUEZ

1:45 PM – 2:45 PM

As freshwater resources become scarce, seawater treatment in Combined Cycle Power Plants (CCPP) emerges as a sustainable alternative. This process, involving filtration, chemical conditioning, and desalination, enhances operational efficiency and reduces maintenance costs. However, potential ecological impacts on marine life necessitate stringent environmental monitoring and mitigation strategies.

ELECTRICAL EFFECT: GIVE AN INCH AND IT'LL COST YOU AT THE METER

CHRIS STELZER, ANDREW LOVEALL

1:45 PM – 2:45 PM

The Electrical Effect refers to non-linear losses in PV modules due to small amounts of shading, which can significantly reduce power output. These losses occur mainly during morning and afternoon backtracking periods due to Row-to-Row shading. This presentation aims to demonstrate the importance of assessing terrain severity and tracker algorithm quality early in the Estimating phase.

DESIGN LEVERAGING – WHAT COULD GO RIGHT?

ERIC SKIBBE, LOGAN THORUP, JONATHAN SEELEY, LEAVEN PHILLIPS, JON BOXLER

3:00 PM – 4:00 PM

Landfill Renewable Natural Gas Projects offer a chance to standardize equipment selection and layout, enabling a leveraged design across multiple locations. This session will cover the Leveraged Program approach, initial design leveraging plan, and key takeaways from the first few projects.

THERMAL HYDROLYSIS

STEVEN GRESETH, BROCK KING, GARY NEUN, JAMAIE SCOTT

3:00 PM – 4:00 PM

Biosolids, the residual product of wastewater treatment, have historically been challenging to manage. The introduction of thermal hydrolysis steam explosions in 1994 revolutionized anaerobic digestion, improving efficiency and reducing costs. This presentation will cover the technical aspects and economic advantages of thermal hydrolysis, as well as frameworks for public-private partnerships and best practices for commissioning and training staff.

ABSTRACTS

PRESENTATIONS FOR FEBRUARY 19, 2025

DEMANDS, REGULATIONS AND EMERGING TECHNOLOGIES IN THE INDUSTRIAL WATER MARKET

DANIEL WILSON, KRISTEN JENKINS

10:00 AM – 11:00 AM

The industrial water market is evolving rapidly in response to stricter regulations, growing concerns about emerging contaminants like PFAS and increasing water scarcity. These challenges are driving the adoption of advanced treatment technologies, including improved reverse osmosis, zero liquid discharge systems and specialized solutions for emerging contaminants. This presentation will explore how industries are leveraging these innovations to comply with stringent water quality standards, address water scarcity and meet their sustainability goals.

BACK TO THE FUTURE IN THE UTILITY ENGINEERING SPACE

VINCENNES LAVALLETTE, DANIEL DARNOLD

10:00 AM – 11:00 AM

The integration of CADD and AI-driven Subsurface Utility Engineering (SUE) techniques has revolutionized utility engineering by enhancing design precision, efficiency, and collaboration. While AI tools improve utility mapping and infrastructure management through advanced data analytics and predictive modeling, the invaluable knowledge of seasoned engineers remains crucial for interpreting complex field conditions. This synergy optimizes current practices and preserves the rich repository of expert knowledge.

MOVE FORWARD WITH CONFIDENCE: ID AND MITIGATE TECHNOLOGY RISKS

SCOTT WESTVEER, ROSVIC NAVARRO

11:15 AM – 12:15 PM

Kiewit is evaluating a client's project utilizing first-of-a-kind technology, which promises significant advancements but requires a lump sum EPC bid with process guarantee wraps. The Technology Risk Memo, prepared by the Technology Group, helps assess major risks and mitigation strategies, aiding the client, execution team and executive management during project and contract development. This presentation examines the preparation of the core elements of the Technology Risk Memo, and its application to projects with emerging technology by reviewing a simple, contrived refinery example.

KEEPING THOSE OLD UNITS RUNNING IS NOW MORE IMPORTANT THAN EVER

DIANE FISCHER, MAX SHERMAN

11:15 AM – 12:15 PM

With significant electric load growth forecasted over the next decade, the need for new power generation is high. This presentation will discuss common projects Kiewit is seeing to improve the reliability, maintainability, operability, and longevity of existing coal-fired and natural gas-fired facilities, especially as older natural gas combustion turbines enter their second or third decade of operation.

EVOLUTION OF PROBABILISTIC FAULT DISPLACEMENT HAZARD ANALYSIS AND TUNNEL DESIGN

PETER CHOU, JERAMY DECKER

12:30 PM – 1:30 PM

This presentation examines the evolution of Probabilistic Fault Displacement Hazard Analysis (PFDHA) for transportation and utility tunnels crossing active fault zones, and recommends a standardized procedure to develop a comprehensive design criteria based on project specifics. It also reviews mitigation strategies from fifteen (15) projects, as well as international practices, to establish a design selection matrix considering fault offset movements, seismic criteria, and post-rupture functionality.

DIGITAL SUBSTATIONS: KEY TO A SUSTAINABLE ENERGY FUTURE

DANIEL GARAYCOCHEA, MATTHEW KLINKER, JEFF COOL

12:30 PM – 1:30 PM

Discover how digital substations are solving the challenges of traditional analog systems, which are often limited by slower response times, less accurate measurements, and higher maintenance demands. By replacing these outdated methods with digital technology, digital substations enhance grid accuracy, speed, and control. You'll gain an understanding of Fiber Optic Current Transformers (FOCTs) and Substation Merging Units (SMUs) —innovations that provide precise measurements, real-time monitoring, and seamless communication across devices under the IEC 61850 standard. These advancements streamline operations, reduce maintenance costs, and boost grid reliability, paving the way for a more sustainable, resilient energy future.

KIEWIT'S ENGINEERING IS THE WIND BENEATH SAF-FUELED AIRCRAFT

KIRAN CHAUDHARI, KEVIN TURINI, JOHN LAI

1:45 PM – 2:45 PM

The transition of aircraft to net zero emissions by 2050 is a key goal for governments and regulatory agencies. Kiewit is aiding new project developers and OEMs in making Sustainable Aviation Fuel (SAF) projects commercially viable, using renewable feedstocks like municipal waste and agricultural residues. This presentation will review SAF production pathways, key challenges, and Kiewit's solutions for scalable production, economic competitiveness, and minimizing carbon intensity.

ENGINEERING INVESTMENTS FOR COST SAVINGS: INTAKE STRUCTURE STABILIZATION

JACOB MACDONALD, SCOTT JONES

1:45 PM – 2:45 PM

The Kiewit Hydropower, Dams and Hydraulic Structures team took on the design responsibility for stabilization measures at a decommissioned hydropower intake structure. By conducting extensive investigations and collaborating with the Construction District, they justified higher shear strength parameters, resulting in significant construction cost and schedule savings. This led to a reduction in the number and size of post-tensioned anchors, benefiting other parts of the project and accelerating the overall schedule.

NAVIGATING THE VARIABILITY OF NATURAL GAS COMPOSITION FOR LNG FACILITY

MOHAMMAD MAHDAVIAN, AIRUI ZHANG

3:00 PM – 4:00 PM

Natural gas, crucial for the energy transition, is liquefied at LNG export terminals to approximately -260°F for transport. Variability in pipeline gas compositions, including impurities like Nitrogen and Benzene, can impact the design and operation of LNG facilities. This presentation will discuss the effects of these compositional changes on unit designs and propose economic and technical solutions.

OPTIMIZING DATA CENTER DESIGN USING COMPUTATIONAL FLUID DYNAMICS

WILLIAM FISCHER, BALJINDER BASSI

3:00 PM – 4:00 PM

The surge in new data centers and chip manufacturing facilities in the US is straining an already maxed-out energy grid. Data centers, consuming about 2% of US electricity, are projected to increase their usage rapidly, with HVAC systems accounting for up to 40% of their energy consumption. Effective thermal management, aided by Computational Fluid Dynamics (CFD) and machine learning, is crucial for reducing operational costs, minimizing carbon footprints, and ensuring uninterrupted operation.

ABSTRACTS

PRESENTATIONS FOR FEBRUARY 20, 2025

THE FUTURE OF ZERO LIQUID DISCHARGE: ENSURING SUSTAINABLE WATER MANAGEMENT

AXEL ARVIZU, BEHRANG PAKZADEH

11:15 AM – 12:15 PM

In the face of a global water crisis exacerbated by climate change and resource scarcity, Kiewit presents zero liquid discharge (ZLD) systems as a sustainable solution for water treatment and reuse. ZLD systems significantly reduce wastewater volume, recover valuable resources, and minimize environmental impact, offering long-term cost savings and improved regulatory compliance. This presentation will outline the processes needed to implement ZLD, highlighting its benefits for various industries and its role in sustainable water management.

COMPRESSORS ON STEEL MODULES

ANIL SHELAR, FNU WITARTO

11:15 AM – 12:15 PM

The modularization technique in construction, widely used in Kiewit's projects, offers high-quality workmanship, cost efficiency, and scheduling advantages. Recently, a client proposed installing large compressors on PAU modules, which could significantly reduce site work hours compared to traditional concrete foundations. However, due to the lack of industrial and code guidance for steel structures under heavy dynamic loads, Kiewit plans to review similar installations and conduct preliminary analytical studies to assess the viability of this approach based on conventional structural framing system.

LOW CARBON FOOTPRINT FUELS USING GASIFICATION

DANIEL MORSE, ANINDRA MAZUMDAR

12:30 PM – 1:30 PM

Lower carbon footprint fuel technologies, such as Ammonia, Methanol, SAF, and RNG/Diesel, are being explored to address global carbon emissions concerns. Kiewit's Waste-to-Energy team is developing these projects using Gasification or Pyrolysis to convert waste into syngas, which is then transformed into low-carbon fuels. This presentation will cover the technologies involved, including Fischer Tropsch, Water-Gas-Shift, and Catalytic methanation, highlighting their potential to reduce pollutants and decouple energy use from greenhouse gas emissions.

AIV AND FIV IN PIPING SYSTEMS

EDGAR BALBUENA, ANDRES VALVERDE, DAVID GARCIA

12:30 PM – 1:30 PM

Acoustic-induced Vibration (AIV) and Flow-induced Vibration (FIV) cause damaging noise and vibration in piping systems, leading to fatigue failures and operational stoppages. This presentation will discuss strategies to prevent these failures, mitigation techniques, and the risks of neglecting such analyses in Engineering, Procurement, and Construction (EPC) projects, supported by real-world examples.

EVOLUTION OF ENGINEERING: LEVERAGING DATA-DRIVEN METHODS FOR FUTURE ENGINEERING

GABRIEL FEDORKO

1:45 PM – 2:45 PM

This presentation explores the integration of International Council on Systems Engineering (INCOSE) principles with data analytics in engineering and construction, focusing on the Requirements Verification Traceability Matrix (RVTM) to link project requirements with deliverables, cost, and schedule. By combining RVTM with historical data analysis, regression models, and machine learning, we can enhance design compliance, cost estimation, and schedule adherence, ultimately improving project planning and execution through accurate forecasts and early risk detection.

EVALUATING AND PREDICTING STORAGE TANK SETTLEMENT

DAVID REDMAN, AUSTIN MCCARTHY

1:45 PM – 2:45 PM

This presentation examines the tank evaluation procedures and acceptable settlement limits for various storage tanks, including single and double wall tanks for liquids like water, crude oil, and cryogenic products. It reviews predicted settlement from geotechnical studies, soil improvement options, and foundation types. Additionally, it includes a discussion of different industry standards and their influence on tank design and serviceability limits.

LARGE SCALE PLATE LOAD TESTS FOR HIGH CAPACITY SKID SYSTEMS

NICK GURA, DAVID BAILEY, LIN ZHAO

3:00 PM – 4:00 PM

This case study details the development, execution, and results of three large-scale plate load tests (PLTs), providing design recommendations for strip footings supporting heavy pre-cast structures. The tests aimed to optimize bearing capacity and settlement for a Mammoet skidding system, resulting in significant construction cost and schedule savings. Traditional geotechnical methods were impractical due to the site's history as a paper mill, necessitating alternative investigation techniques.

KIEWIT GENERATIVE AI ENGINEERING

OSCAR SALAZAR, RICHARD KLASSEN

3:00 PM – 4:00 PM

The “Kiewit Generative Engineering” initiative leverages Python programming to automate hydraulic capacity calculations for current project work, significantly reducing recalculation time and ensuring accuracy. This highlights the benefits of automation in hydraulic modeling and its potential applications in other civil engineering domains, enhancing engineers’ capabilities and fostering more efficient practices.