



BAKKEN

OIL REPORT

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BAKKEN OIL PRODUCTION ON THE RISE

Davis Refinery leading
the way to a clean
energy future

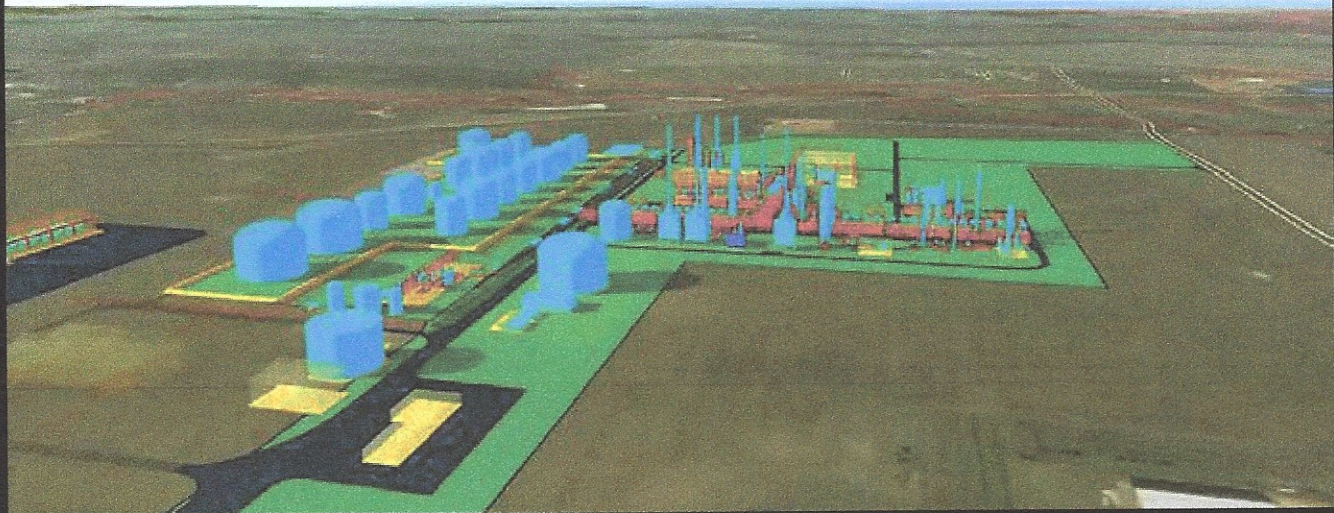
Infrastructure bill
to help meet
workforce needs

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How a refinery is leading the way to a clean energy future

By Meridian Energy Group Engineering staff & partners



Meridian's Davis Refinery in the Bakken has the distinct advantage of being a greenfield project, which will be the most efficient, smartest, ultramodern refinery ever built. It utilizes a distributed business model, self-funded and completely independent in its design and operation. The Davis Refinery will serve as Meridian's winning formula in future Shale Basin projects in the coming years. Davis is designed to meet the requirements of the State of North Dakota's Department of Health (NDDoH), among the strictest in the U.S. Additionally, it was designed to meet Class 1 EPA air quality standards.

The Davis physical and operational design includes implementation of state-of-the-art, lowest achievable emission rate (LAER) technology, and air pollution control equipment considered best available control technology (BACT) to minimize emissions throughout the plant. In fact, Meridian's design for Davis includes BACT requirements and controls that are considered maximum achievable control technology (MACT) within the industry.

A greenfield refinery like the Davis Refinery is not burdened with the need to make the new operating units work in

conjunction with pre-existing legacy operating units that might also represent old technology. This will ensure that the Davis plant can leverage the latest technology from the ground up and can much more easily and efficiently comply with modern environmental and safety requirements. Clean fuels technology leveraged in the Davis Refinery will ensure its operation and products comply with all regulatory requirements for the duration of its operational lifecycle.

ADVANCED DETECTION TECHNOLOGY

Meridian will ensure the required strict air quality standards are met with a comprehensive and enhanced Smart LDAR program which will be used to monitor fugitive emissions throughout the plant. This innovative solution greatly exceeds the current minimum regulatory requirement, which mandates periodic (monthly or quarterly) walkthroughs of the facility. This will minimize any potential sources of unintended leaks, which usually account for a large percentage of hydrocarbon emissions at refineries.

For this reason, and to minimize the potential for unintended leaks at the Davis Refinery, Meridian's LDAR program will utilize OGI (Optical Gas Imaging technology) to continuously

OUR REVIEW

Emission Calculation Review

- Reviewed calculations
- Verify that emission factors used to calculate PTE are achievable in practice.

Technology

- Uses Hydrocracking Unit vs. FCCU
- Selective Catalytic Reduction
- Continuous Emissions Monitors (CEMs)
- Optical Gas Imaging (Camera)
- Fenceline Benzene Monitors

CONTROLS REQUIRED ON DAY ONE

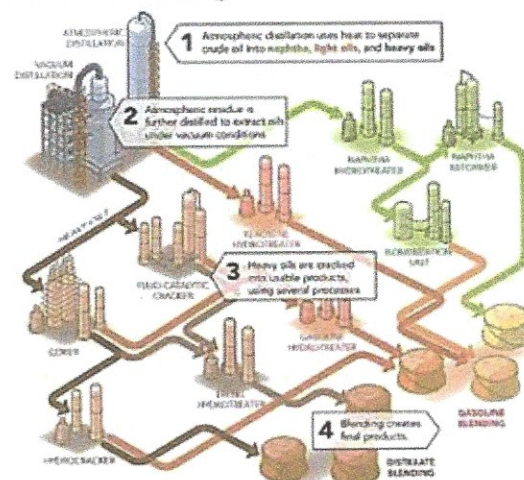
scan the facilities. While fugitive gases are normally invisible to the human eye, OGI cameras employ specialized infrared filters which allow them to “see” gas should it ever escape. The Smart LDAR proposed by Meridian will allow automated early detection and notification of unintended leaks as they appear, and the visual confirmation provided by OGI will be extremely useful in pinpointing the exact source to begin the repair process immediately. Since 2015, OGI has been identified by the U.S. EPA as the “Best System of Emission Reduction” for detecting fugitive emissions from new equipment installation, upgrades, and modified sources.

Meridian is implementing a significant level of monitoring of emission levels via both an enhanced LDAR program, as well as stack test data and in-stack continuous emission monitors at all major point sources throughout the plant. In addition, though not required by regulation, Meridian has also decided to install perimeter fence monitors at the site to further ensure compliance with National Ambient Air Quality Standards. At the time that the Davis Refinery starts operations, there will be no other facility in North Dakota that will have as much monitoring in place, monitoring that is also specified by the permit to construct issued. Due to the significant level of controls that are being installed on the facility throughout the plant, the emissions are at levels that would be equivalent to a small concrete batching or asphalt plant, or less than 10 pump jack operations.

SOFTWARE SYSTEMS

The Davis Refinery will utilize the latest generation of digital technology from the ground up to provide the most efficient and powerful data handling environment. This will include technologies such as a wireless smart grid, advanced process

Crude Oil Refining



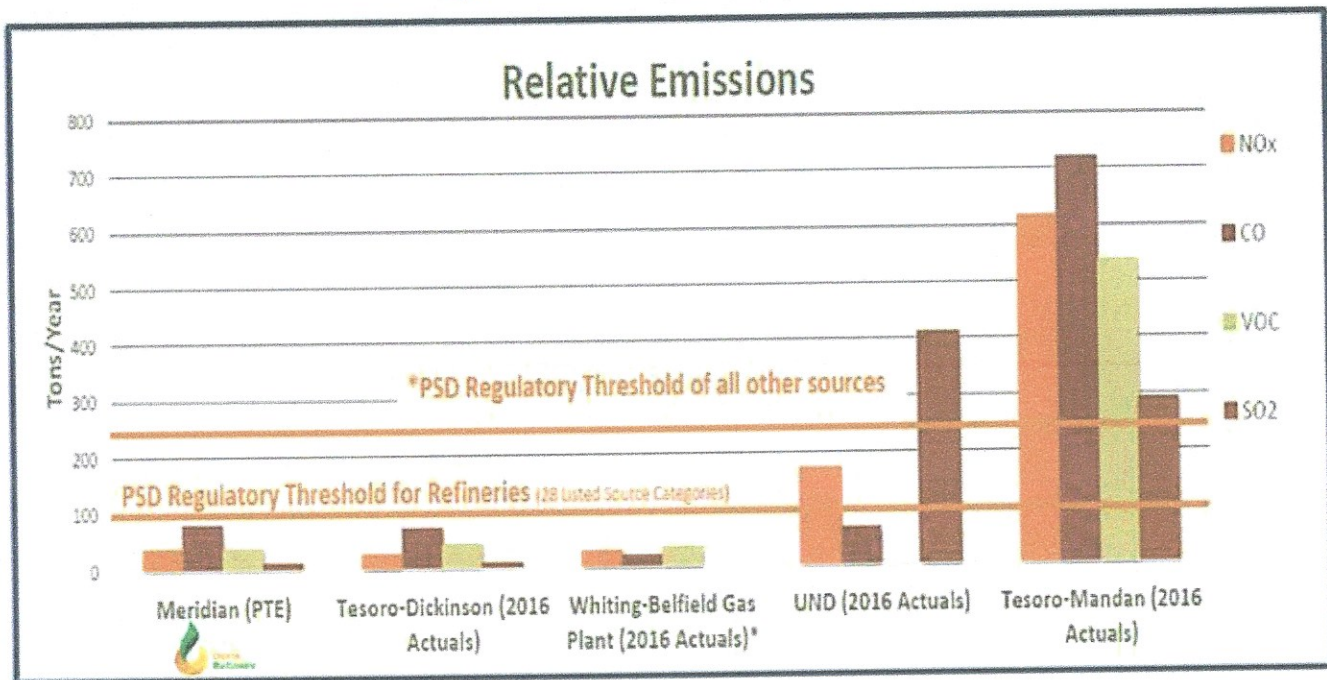
Example Diagram, not Meridian Davis Refinery

The Davis Refinery will serve as Meridian’s winning formula in future Shale Basin projects in the coming years.

TABLE 3: INVESTMENT EFFICIENCY OF GHG EMISSIONS REDUCTION (REF: KARRE PHD 2019)

Technology	Assumed Life Span (years)	\$GHG Abatement Cost / mt Co2	\$1 million investment will result in reduction of GHG emissions in mt CO2e
High Penetration Wind	25	33.00	1212
Nuclear	40	14.00	1786
Solar Photovoltaic	20	28.00	1786
Low Penetration Wind	25	19.60	2041
Existing Refineries	30	12.40	2688
*Cars Plug-In Hybrid	10	28.99	3449
Davis Refinery	30	9.47	3520
Geo-Thermal	50	5.60	3571
Cars Plug-In Hybrid	10	15.40	6494

*Including emissions from electric generation



control, integrated field data management and predictive analytics to optimize the operation in real-time. In totality, these systems will generate intrinsic benefits in equipment reliability, health and safety, and environmental compliance. These include:

INFORMATION SYSTEMS

- Provide accurate and efficient data flow from design through operation
- Provide state-of-the-art plant information display and control systems
- Utilize cutting-edge software platforms for ERP and infrastructure control
- Ensure data integrity and security are maintained inside and outside the facility

OPTIMIZATION STRATEGY

- Utilize advanced process control to improve process efficiency
- Utilize preventive/predictive maintenance for equipment reliability
- Utilize economic optimization models for short- and long-term planning
- Utilize KPI's for measuring and achieving strategic goals

REDUCTION IN GREENHOUSE GASSES: A LOW-CARBON INVESTMENT

The control systems, advanced technology, and continuous monitoring of the project will ensure that Davis will have the lowest emission rates for NO_x, CO, SO_x, VOC, PM 2.5, PM 10 and greenhouse gas (GHG) emissions than any other refinery constructed. The Davis Refinery is more cost effective at CO₂e reduction than any other refineries studied and is more cost effective than wind (1212 mt CO₂e) or solar (1786 mt CO₂e) technologies. Supporting this technological achievement of Meridian is in fact an investment in green technologies and the future. Meridian's refineries are a climate change solution – as a Meridian refinery reduces GHG emission by far more than that same dollar invested in either wind or solar power.

In developing Davis, Meridian has generated substantial trade secrets and corporate know-how dealing with the design and operation of small, cost-effective crude oil refineries. Green tech refineries such as Davis will serve local markets using crude oils with the ability to be placed into service quickly as synthetic minor sources (SMS) projects under state and federal permitting laws and regulations. Meridian will increase value by applying this know-how to additional Davis-style refinery projects in other shale basins. The company intends to build its second such facility in West Texas and has initiated siting and permitting for a third facility in another strategic area – setting a standard throughout the U.S. ▀