Petroleum Engineering Design Process

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988 Words

Surfside Beach, Texas, a frequent summer retreat just southwest of Galveston, offers idyllic days with splashing waves and warm sun over beautiful waters. Family time is filled with laughter, sandcastle building, and relaxation under a tent with friends. Amid this joy, a distant sight—the silhouette of an offshore oil rig—captured my 6-year-old curiosity. Asking my father about it, I learned its importance for energy despite its risks, including the environmental impact of oil, reflecting on the Deepwater Horizon Spill near this beach a decade ago. I've since been on a mission to advocate for responsible petroleum use.

The offshore oil rig located just off the coast of Surfside, TX:

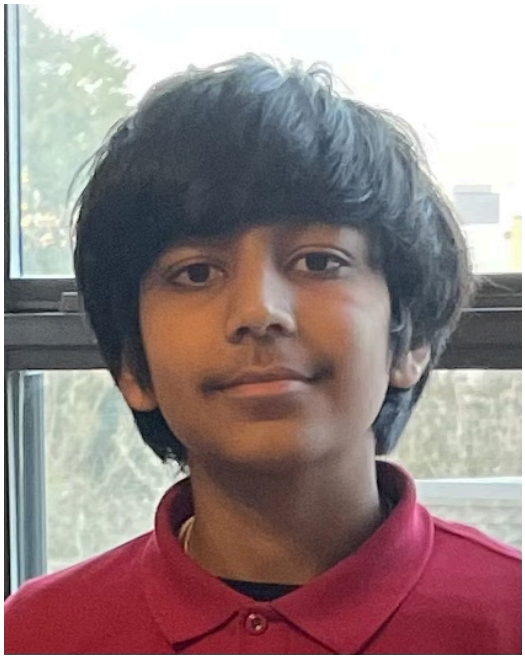
Credit: CNBC

Dhruv Goyal and I, Vir Sanghavi, have dived into the world of petroleum engineering, standing at the forefront of energy innovation, and providing energy for billions of people around the globe everyday. Petroleum engineers build complex structures in order to extract and process oil and gas, and are instrumental in orchestrating this very process. Their design and construction process is very similar to that of our team, 77098A, and I would like to explain how. I will answer 3 key questions to clarify this:

1)Why did I choose this career?

2)How does the engineering process in petroleum engineering relate to VEX robotics?

3) How has VEX robotics prepared me for a future in engineering?



Left to right: Vir Sanghavi, Dhruv Goyal

1. Choice of STEM Career:

We selected petroleum engineering because of its ability to promote long-term, sustainable, renewable energy, and I want my career to help with that, especially in preventing oil spills like the Deepwater Horizon one mentioned earlier. However, the reality of today's world is that 80% of energy comes from oil and gas, and not only that, but also the components of renewable energy require byproducts of oil and gas to construct. For humanity, it is imperative that we transform petroleum engineering into an industry that can sustain for the long-term. But the question arises, "How does the regulation and understanding of petroleum engineering help foster renewable energy?" To answer this question, we need to realize that petroleum is necessary for human survival, and its byproducts (plastics, gasoline, jet fuel, etc.) are crucial in multiple industries. When we regulate the use of petroleum, we incentivize a

switch to renewable energy, which helps the environment while imposing regulations on the use of petroleum.

2a. Understanding the Petroleum Engineering Design Process:

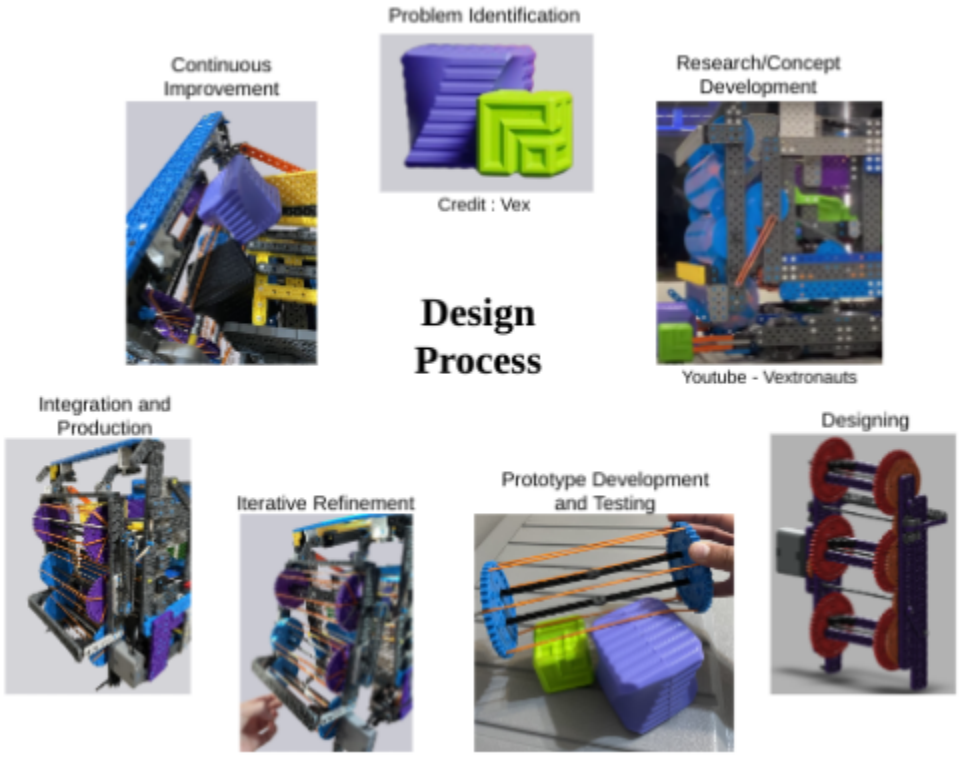
The petroleum engineering design process uses several steps that petroleum engineers follow to address different problems and find solutions:

1. Problem identification: This step is found at the beginning of all design processes. An engineer must find a problem to then try and solve it. Additionally, they must identify their design constraints to effectively tackle the problem within the 'boundary conditions'. An example would be an oil drill not reaching far enough into the ground.
2. Design: This step is also found in engineering design processes as this is the part where you brainstorm ideas and research about your problem. An example would be looking at past oil rig designs.
3. Development: Petroleum engineers develop the technology that is needed in order to extract and explore the petroleum.
4. Testing: Petroleum engineers test systems that have been developed already.
5. Crude oil scouting: No one knows where all of the crude oil is in our world, so it is extremely important to use large-scale AI modeling software to map out the places with known crude oil and natural gas reserves.
6. Implementation: Petroleum engineers implement efficiency improvements that they have designed by this point in the process
7. Repeat: In this iterative process, engineers continuously have to find and solve issues and improve safety and efficiency.

Oil wells located in Texas drilling at sunrise.
Credit: Hill Country Exploration

2b. Comparison with Our Team's Approach:

Analyzing the petroleum engineer's design process, we found similarities and distinctions from VEX Robotics. Both involve systematic progress from problem to solution, but the petroleum industry's risks add complexity with safety, environmental concerns, and intricate technologies. This contrasts with robotics, where precision is crucial, and consequences are less severe. For instance, a robot breaking affects tournament progress, while an oil rig failure may lead to injuries or fatalities. Yet, parallels exist; our team follows step-by-step building, programming, and design, using modular designs like petroleum engineers for productivity and efficiency.



3. Preparation through VEX Robotics:

Participation in VEX Robotics has prepared us for future careers in petroleum engineering. Robotics competitions highlight teamwork and individual accountability, mirroring the energy sector's dynamics. Additionally, refining robot designs aligns with the perpetual-improvement mindset in petroleum engineering. The adaptability and problem-solving skills gained are

transferable to the evolving petroleum industry. Our use of CAD modeling and documentation in an engineering notebook parallels essential practices in various engineering fields, and CAD modeling can also be applied to later endeavors such as high school and college. These skills extend beyond robotics, aiding tasks from building VEX IQ robots to academic challenges. VEX Robotics plays a crucial role in my STEM learning journey, propelling me from a 6th-grade novice to my school team's confident captain, ready for future engineering endeavors.

Exploring petroleum engineering through this challenge has been enlightening. It broadened our understanding of engineering applications in the energy sector and highlighted the interdependent relationship between robotics design processes and the challenges faced by petroleum engineers. This multi-field exploration has fueled our enthusiasm for a future where innovative engineering solutions drive sustainability and efficiency in the global energy landscape. Ever since I heard about the Deepwater Horizon disaster and its catastrophic effects, I have felt a drive to stop that from ever happening again, and protect the petroleum industry because of our need for it. By understanding the connection between VEX Robotics and petroleum engineering, we begin to walk on that path.