A2.1: CONSTRUCTION AND ENGINEERING

UNIT 1

Project Innovations

PROJECT 1

Many clothing brands have failed because they did not design marketable products using a good business plan. Often times, clothing brand owners do not use their capital in efficient ways. They can be surprised with unexpected costs and do not run the business in the most efficient and professional way.

The goal of this project is to create a clothing brand that incorporates innovative designs along with an effective business model. This includes using a process called ‘decision analysis’, during planning phase. Creating quality products while being as cost effective as possible is vital to success in the fashion industry. Industrial engineering techniques will be what makes a brand distinguish itself from similar competitors. Every business needs to be profitable to be successful, and this project will show how to achieve success with minimal initial capital. These methods along with unique designs will pave the way to a successful clothing line.

PROJECT 2

One of the most often used tools in a residential kitchen is the cook's favorite pot or pan. And because many people do not like washing the dishes by hand, there is a need to clean pans that are used for each meal immediately. Currently there are few products that speed up the hand washing process. Also we feel that a product that speeds up hand washing may be useful in areas where full-size dishwashers are not common. Our team will work collaboratively to solve this problem.

After conducting a wide-ranging market survey, we designed our first iteration of a device which can fill the existing gap between hand washing and washing dishes in a dishwasher. We successfully built a single pan dishwasher which simulates hand washing to clean nonstick frying pans. After testing we are ready to share our results.

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UNIT 2

**The Current - Electric News**

During the winter of **1887** *-* **1888** American Engineer Charles Brush finalized the world’s first automatic wind turbine to produce electricity. The turbine was enormous. With a rotor diameter of **17 m** and **144** rotor blades, it was the largest in the world. (Can you see the person in the picture?)

Despite the size of the turbine, it was a **12 kW** model. There is a small fraction of modern wind turbines which range from **2.5 - 3 MW** each. Modern wind turbines are arranged strategically to collect as much wind as possible in wind farms. If turbines are too close to each other, efficiency is reduced. The most productive wind farm in **2017** was in China, the Gansu wind farm had a capacity of more than **6 MW**. They also only have **1 - 3** blades typically, though there are some variations of vertical turbines that have more.

Turbine design is quite complicated as wind is not constant. Also, the design of the turbine affects the wind it is capturing. Most modern turbines can generate electricity with a minimum speed of **3 m/s**. But did you know that there is a maximum speed as well? Usually about **25 m/s**. This is because the power of wind increases by the cube of the wind speed. Turbines are designed with electrical and mechanical braking systems to slow down their speed.

For industrial turbines, electrical generators are placed at the top of the tower. These are typically connected to a wider electrical grid. When wind speeds are high, electrical companies that use these farms will typically limit the power produced from hydroelectric dams by retaining water, or limit other production like coal, natural gas or nuclear power. One of the biggest challenges of wind and other renewable energy sources is the ability to store power long term with efficient batteries. Tesla has a deal with Australia to produce the world’s largest battery (**100 MW)** but will this be the future of wind technology?

What do you think about the future of wind or other renewable energy sources? Drop us a line!

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UNIT 3

Engineering’s Greatest Innovations

Tower Crane

Equipped with ropes or chains and pulleys, this machine can lift and lower materials or move them horizontally. Their iron motors are often exposed to extreme weather, and chambers and pistons are designed to protect against salt, wind, and hot or cold temperatures.

Locomotive

Early models used steam or diesel for fuel. Today some of the fastest models use electric motors combined with magnetic levitation (maglev). Maglev is an important aspect to reduce friction allowing the machines to be faster and more efficient.

Blender

There is generally one or more of these per household, and it is hard to imagine how people lived without them. Their ability to turn electric energy into mechanical energy is simple, but effective. Next time you want a refreshing beverage, remember how this little electric motor has revolutionized our lives.

Electric Car

Although the technology has been developed for nearly a century, they’re only recently available to consumers. As global CO² begins to become a problem, these zero-emissions vehicles are becoming more popular. Many have both electric and gas engines. The electric motor runs on battery and is charged when braking, converting mechanical energy to stored potential energy.

Airplane

These typically use gas turbine engines. Lifting such heavy machines thousands of feet into the air requires lots of fuel, that makes these machines very inefficient. This is a great demonstration however of converting chemical potential energy to gravitational potential energy albeit with some loss, of course.

A2.1: CONSTRUCTION AND ENGINEERING

UNIT 4

**Take My Job**

What she does

Look around you, the building you are in, the road you took to work, the street lights that light your walk at night and the bench you sat on to have your lunch: Brianna keeps them all running, in Austin, as the city Site Plan Engineer. She works with a dedicated team of civil, traffic and environmental engineers to make sure that the infrastructure we use every day works. She will sometimes work with private companies and city officials too. They work together to make sure that new development plans are implemented correctly. Brianna often consults with her team to review aspects like vegetation, wildlife, soil conditions and hydrology in the area before construction begins.

Once a project or site plan is approved Brianna must review the plan and make sure all the details are legal. Does that land parcel meet the legal zoning requirements? Has this plan been approved by local administration? Are there any complaints or input from citizens that might affect the plan? These are all questions she must address before giving final approval.

How she got the job.

Brianna started her career in engineering by attending a 6 year program at City College in New Jersey. It was rigorous and prepared her for work in both public and private sectors. After college, Brianna started out as a civil engineer in Houston. There she worked surveying areas for new sidewalks and bike paths. “It wasn’t a glamorous project” she admits, “but it did give me a solid foundation of practical experience.” She recorded slopes, elevations and made notes of floodplains and potential risks. Here she learned about the “ins and outs” of working with government and private interests. After 4 years in the job, she found a golden opportunity for promotion in Austin where she started as a Transportation Management Specialist. She was promoted 2 years later to her current position.

Who would want this job?

Brianna is ready for retirement but says she is sad to leave her position, it is bittersweet. She says the job is for anyone that has 3 or more years of experience working as a civil engineer. It is important that candidates have experience leading projects and understand how to keep deadlines. “Some candidates might need to remember that you also need good people skills” she says. Finally, “Don’t skip the details” she warns. “You might be rebuilding 10 miles of highway, but you also have to make sure the lines are straight!”

For more information about the job opportunity click the link below.