Assignment 1 – Understanding Business Requirements

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Diapers are a household essential for families with newborns and young children, as well as elderly and sick. Disposable diapers became a common solution for all the inconveniences of cloth diapers. A disposable diaper is composed of an absorbent pad layered between two sheets of nonwoven fabric. The pad absorbs and retains body fluids many times its weight, and the nonwoven fabric gives diapers shape and prevents leakage. Creative innovations continue to improve the quality and design of disposable diapers. Despite these innovations, the manufacturer can face some challenges in the process of making disposable diapers. The product can be improved by analyzing two factors: raw materials and manufacturing. Additionally, future considerations can be made regarding diaper disposability.

Raw Material:   
The absorbent pad needs to balance the polymer’s ability to retain enough water and the polymer’s strength, so it does not deform under stress. Fibers dispersed throughout the pad mitigate this issue, but the ratio of polymer to fiber must be optimized. Absorbency can be optimized by providing material weight to weight of absorbed water of different polymers. Another parameter that can improve absorbency is the polymer to fiber ratio. The size of the particles is also very important. Data can be collected for particle size and the rate at which the fluid is dispersed throughout the pad. All these parameter variation can finally be tested with and Absorbency Under Load (AUL) test, which simulates absorbency of a diaper with a baby sitting on it.

The nonwoven fabric, used for the top sheet and back sheet, can be optimized by choosing materials that are cost effective, and easily manipulated. Different kinds of resin can be investigated for melting temperature, and pressure to push them through holes during manufacturing.

Manufacturing Process:  
The biggest problem that might lead to a bad quality product is problematic manufacturing. Poor manufacturing process can also decrease profit margins and create inefficiency. A great example of this is the manufacturing of the absorbent pad. As the dispenser sprays out the fiber material, we can control the pressure to minimize fibers lost, reducing overall cost. The vacuum on the conveyor belt can also be controlled to minimize the particles pulled through the perforations while keeping the pad in place. An optimized sequence of fiber and polymer will create an evenly absorbent pad with minimized gel blocking, as well as mitigate the problems. We can experiment with varying thicknesses of each layer. After the pad is formed, a leveling roller removes a portion of the fiber at the top of the pad to create a uniform thickness. We can control the variance of the amount of material sprayed to the conveyer belt to decrease this layer going to waste.

The manufacturing process can also be enhanced for the nonwoven fabric. The nonwoven fabric is made from plastic resin produced as a wide roll. This roll is then cut up into the size of the diaper. This step can be enhanced by designing different cuts to maximize the number of diapers per roll.

All these components are then assembled together, folded, and packaged for shipping. When the parts are assembled together, the alignment of the components must be checked. Otherwise, there might be leaking. Data can be collected for the number if misaligned diapers that do not make it to the final stage. The machines should be calibrated to reduce the variance of component misalignment. The number of diapers that can fit per package can be maximized to reduce shipping and packaging costs.

Future Considerations:  
Environmental concerns are growing with time and becoming a consumer priority. The disposability of diapers can improve with biodegradable plastics. Alternate materials should also be researched for their biodegradability and ability to be composted. As more plastic alternative materials become available on the market, the polymer in the absorbent pad can be replaced with a carbon based material.