Shuyang Ren

Assignment 1:

From the article, the key attribute for quality control for diapers is the absorbency. One of the key aspects is the polymer to fiber ratio. According to previous industrial trials optimizing for performance and cost, the ideal fiber to particle ratio should be between 75:25 to 90:10. Another important aspect is the distribution of the particles. It is known that it would be good to have particles with mass median greater or equal to 400 microns

So, from the information above, we can already identify a few key data that we should try to acquire:

* Particle/polymer
* Fiber
* Distribution/size of particle
* Absorbency
* Cost/price

There are already several test the industry use to establish absorbency, with a target of having at least 24 ml/g after one hour of testing.

Another aspect that is harder to quantify that the diaper industry worry about is comfort, which is dependent on the melt chrematistics of the nonwoven fabric on the diaper’s shell. Materials used can’t have too different of melting points or the ones with a lower melting point will get too soft too fast. Comfort is something we can test separately than for absorbency, so first we will focus on just absorbency.

For absorbency, as mentioned in the article, we should try to optimize for performance-cost ratio. For this we will have our key attribute be absorbency (AUL) divided by price/cost of materials ($, probably). We then have quantity of polymer/particle and quantity of fiber as well as distribution of particle/polymer for the other columns. Our data points would simply be different variations of this variables that exists in the forms of different diapers. This would mean for mass production of different diapers just to see how each one performs, which can be somewhat arbitrary, and our number of observations would be purely dependent on how much resource we are willing to spend manufacturing diapers just to see how diapers of different attributes perform. Now some would suggest that we simply sample diapers of other manufactures since it’s likely that they have different standards and we can use those data for comparisons. However, my concern is that the manufacturing process might be different even if materials used are the same (which is also no guaranteed). It would hard to control for other aspects of the diapers when dealing with different manufacturers. Ideally, we would also have past data points and records that we can use. But we must make sure that the materials used are all identical except for the few features that we are observing.

As for comfort, I am not sure exactly how this can be tested as it is a very subjective and non-quantifiable characteristic. The article provided no mention of how this is tested. Perhaps there is a professional worker whose job is to test how comfortable the diapers are? But assuming we could get a data type that would quantify comfort for on analysis, we can regress it against the different materials used. All in all, I rather leave this aspect alone as of now with what information we have.

Another key aspect mentioned was leakage, but again the article did no go very in-depth into this one so I am not sure what kind of data we would need for it. But if in theory we have the necessary data and features for both leakage and comfort, we can put everything together and see how to best optimize for all three fronts: leakage, comfort, and absorbency. The article did mention an issue they face when it comes to improving leakage is that they don’t want to sacrifice comfort. It is likely that there are some tradeoffs to be made among these aspects when it comes to diaper manufacturing, and that’s something we can try to optimize for too.