Many low speed vehicles today have Polyurethane based tires as opposed to regular tires. These vehicles use high resilience polyurethane foams due to the material's sunlight resilience and inability to dry out over time. Moreover, a special type of these tires, based on a closed-cell polyurethane foam, are unable to go flat. This closed-cell structure relies on plenty of air bubbles spread throughout its tire shape to give the materials its required 'bounce-factor'. To formulate the foam tires, the manufacturers must first make a solid, two-sided mold for the tire.. To formulate this mold, the manufacturers first take a metal mold fit for the vehicle and fill it with polyurethane elastomer. Then, they mix the liquid to release air bubbles, and heat the mold using both a torch and hot table to solidify the final tire. To continue with the process, they must thoroughly mix the compounds needed to make the foam. According to US Patent 5070138A[1], a typical PU tire formulation consists of Isocyanate, Polyol, and Water. An industrial mixer combines precise amounts of these compounds until the mixture passes a quality control foaming test. Upon passing inspection, the mixture can then be added to the previously discussed mold in order to make the final product.

While PU tires are useful for smaller vehicles, regular tires are used for larger and heavier vehicles. This begs the question, what are the main differences between these tire types, and what are the advantages and disadvantages of these polyurethane tires. For regular rubber tires, they are traditionally manufactured with natural or synthetic rubber, and can be reinforced with fabric or steel in some cases. They are also filled with air, so thus have more natural shock absorption. PU tires on the other hand are manufactured as described above, and have natural puncture resistance, while lacking the natural impact resistance. This lack of shock absorption leads to one of PU tires' main advantages, being its increased load-bearing capacity when compared to regular rubber tires. The tires' closed-cell structure also allows for chemical and water resistance. As the tires are fully solid, the PU tires exhibit superior wear resistance as well. These factors combine to make a product that is fit for specific industrial and environmental applications.

Despite the materials advantages when it comes to producing these tires, they also possess significant disadvantages that prevent their widespread use and make usages in certain industries next to

impossible. For one, the tires are significantly heavier than usual tires, as they do not have the lightweight air component crucial to natural rubber tires. Moreover, the previously mentioned lack of shock resistance results in much worse ride comfort. If these tires were used in applications like everyday automobiles, drivers and passengers would experience bumps and changes in the road more severely. Also, the maintenance and production of the tires is much more involved, requiring precise molds and mixing techniques. Finally, the tires closed-cell structure makes heat dissipation much more difficult. When compared to regular tires who can transfer heat through the pressurized air, the PU tires' solid inside easily results in overheating and potential failure when used in incorrect applications. These disadvantages come together to ultimately prevent the product from being used everywhere in modern society.

Ultimately, PU tires are an incredibly useful product for slow-moving vehicles which will experience wet and otherwise water-logged areas. Although the tires are incredibly versatile, I do not think they should be used in high-speed applications like airplanes. The shear speed airplane wheels experience upon landing would tear apart the wheels due to a rapid build up of heat. Without the air to provide impact resistance and heat transfer support, the wheels will ultimately fail. It would not be wise to use these tires as aircraft wheels for these reasons, and they should stick to being used for their small-vehicle, industrial applications with the current state of the technology.