Nylon 6-clay hybrid (NCH) is a recently improved nanoscale composite which has been used successfully in industrial applications. In order to make the nanocomposite functional and attainable, researchers at Toyota had to exfoliate clay nanolayers and disperse them in the nylon-6 matrix. Clay naturally has a strong tendency to aggregation due to strong van der Waals and electrostatic forces which make it difficult to use in an unmodified state. To combat this, researchers used a compound with a structure of $NH_2(CH_2)_{n-1}COOH$ to organically modify the clay so that the particles swell and have less attractive forces between them. This reduced interaction in the clay allows the clay to better interact with the nylon 6 matrix. The researchers then polymerized the nylon 6 in the presence of the modified clay, which allowed the polymer to insert between the clay layers. As polymerization progressed, the nylon chains grew and further dispersed the clay particles until they were fully exfoliated, or fully separated into nanolayer platelets.

This process was successful in the creation of the nanocomposites, but some may wonder why the researchers could not simply blend nylon-6 resin and clay in the molten state to achieve the desired product. The above synthesis process is necessary to circumvent the attractive forces naturally found in clay. Moreover, the process allows the nylon to further spread the clay particles, creating a more uniform final product.

Due to the favorable physical and permeability properties possessed by the composite, NCH has seen use by Toyota in their timing belt covers. In addition to use for that specific automotive part, applying this composite to be used in automotive fuel tanks and hoses. These were presented in the paper as alternative applications of the composite, and for good reason. Firstly, the physical properties of the composite allow it to be injection molded, which is desirable for hose and tank applications. Also, NCH was reported to have superior thermal and mechanical properties when compared to Nylon 6, which would be useful for fuel hoses (mechanical properties allow ease of use by the public), and fuel tanks (thermal properties and mechanical properties alike allow the composite to be a safe and effective choice). Moreover, NCH's reduced gas penetration is desirable when working with toxic and flammable gases. As found and reported in the assigned paper, the NCH gas barrier characteristics were effective unilaterally, meaning they were effective regardless of the gas type. Ultimately, the addition of clay to the nylon 6 creates a composite with thermal and mechanical properties fit for use in automotive parts. Specifically, the clay nanoparticles reduce gas permeability, increasing the safety and stability required for parts making direct contact with volatile gases.

To effectively produce fuel tanks or hoses, I propose using injection molding as the processing technique. With 8 wt% or less montmorillonite addition, the researchers found that NCHs can be injected molded. These NCH melts were found to have "low viscosity and excellent flow properties", which allow the melts to be effectively injection molded. This processing technique is favorable as it is highly automated and has a low scrap rate. Moreover, the technique produces products which maintain the mechanical integrity and thermal stability of the original composite. Ultimately, injection molding should be explored for the manufacturing of automotive fuel tanks and hoses with NCH composites.

Toyota has recently shown the advantages of using NCH based composites to create automotive parts. The composite has superior mechanical and thermal properties when compared to its constituent materials, and its low gas permeability makes it a desirable material for various automotive parts and products. Given its favorable flow properties and low viscosity, NCH can be effectively processed using injection molding, making it a strong candidate for manufacturing fuel tanks and hoses. This method ensures high efficiency, minimal waste, and optimal performance, reinforcing NCH's potential as a superior material for automotive components.