Reduce friction in the engine and you reduce CO₂ emission and improve the engine efficiency. In current chain driven valve timing systems, almost 50% of the friction losses are attributed to chain to tensioner arm and guide contacts. Friction reduction can achieve fuel savings that would require an equivalent replacement of 20 kilograms of material using ‘conventional’ metal-to-plastic conversion.

Estimating the impact of material on friction

Reducing the friction in the chain tensioner system is a complex assignment. The chain and arms take 43% of the total friction, and this friction is a depending on a variety of effects. Material selection is one, others are oil viscosity, oil additives, the temperature of the engine and the surface roughness. Based on our expertise and knowledge we developed an analytical approach to measure, calculate and predict the effect of all these variations on the total friction. These models show that Stanyl HGR2 enables to bring a friction reduction of 20% - 40% in the boundary lubrication regime.

Lowering friction in powertrain systems by tuning tensioner materials

- Friction reduction of 20% - 40% in the boundary lubrication regime compared to PA66
- This results in up to 1% fuel efficiency and thus a cost-effective solution in fulfilling CO₂ legislation
- Ford and other OEM's will include Stanyl HGR2 in the options to improve the fuel economy of its future engine platforms.
DSM has developed a portfolio of materials, answering every challenge in friction performance and system robustness. Various Stanyl grades are all commercially proven solutions and have become the industry standards; 60% of all newly built cars utilize PA46 in its timing chain system. As a recent success, Stanyl HGR2 has been chosen for low-friction slide shoes within the timing system on a new generation of energy-efficient turbocharged petrol engines by Nissan, Suzuki, Ford and other OEMs. DSM is committed to continue the development for better solutions with even lower friction that will help to further reduce CO₂ emissions from automobiles.

FEAD:
Stanyl is recently introduced to the industry to replace aluminum in FEAD auto-tensioner systems — and in particular for the alternator mounted tensioner. A high strength, high stiffness and thermally conductive grade has been developed to maintain correct idler pulley alignment on the plastic tensioner arm whilst being able to heat sink the damping energy away from the friction interface. Classically sandwiched between the aluminum tensioner arm and tensioner base, Stanyl TW371 provides the necessary wear resistance and consistent damping performance — along with excellent chemical and heat resistance in an area exposed to dirt, rain, under-the-hood liquids, and engine heat.

Gears:
Plastic actuator design is a dynamic field, where the plastic provides great design freedom, enabling gear configurations too difficult or expensive to create with metal. DSM has been successfully pioneering in this field and Stanyl is used in over 200 million vehicles worldwide in actuators such as electronic throttle control (ETC) and exhaust gas recirculation (EGR). Stanyl offers best-in-class tribological behavior, especially at high temperatures and in dry-run, with up to 50 percent less wear than PPA, PEEK, PA66. Due to high performance of Stanyl plastic material, cost savings can be obtained by design optimization, wall thickness reduction, but also processing optimization versus competitor plastic materials.

Proven performance in low wear & friction solutions

From lab scale to real engines
Based on motorized engine testing by BorgWarner Inc. on Ford engine timing drive and valve train, the influence of material on crankshaft torque was measured. As the graph confirms, Stanyl HGR2 shows the lowest torque of all as measured on a real engine geometry. This directly benefits the fuel economy the complete system.