

Amoco Performance Products, Inc.

TORLON[®]
Automotive Parts

Proven
tough
enough
to replace
metal.

*Two liter double overhead cam "plastic engine"
weighs only 168 pounds yet develops
318 horsepower at 9,000 rpm.*

TORLON®

Race-proven in 59 engine parts

The world's first "plastic engine" powered a world-class race car in two seasons of International Motor Sports Association (IMSA) competition. The engine, composed mostly of plastic parts, withstood the rigors of thousands of miles of testing and racing in 1984 and 1985.

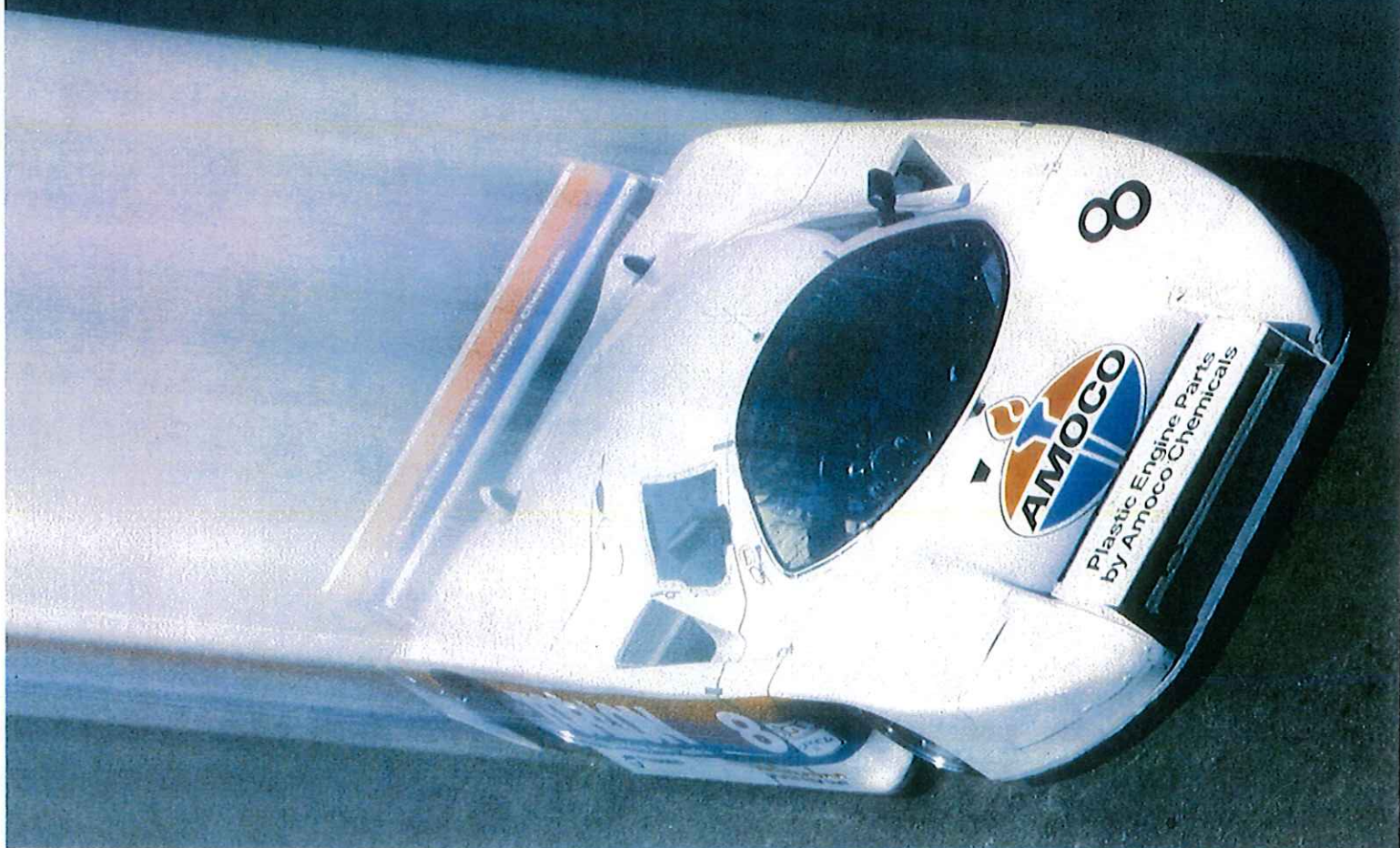
Amoco undertook the project to dramatically demonstrate the strength, endurance and high

temperature resistance of TORLON® parts. Fifty-nine of the engine parts and one ancillary gear were injection-molded from Amoco's high performance TORLON polymer.

The Lola ran in three races in 1984, ending with a finish in the New York 500 endurance race at Watkins Glen, New York. Three strong finishes rounded out the 1985 season; third in the Connecticut

Memorial Day race at Lime Rock, fifth in the Lumbermens 500 at the Mid-Ohio Sports Car Course, and fourth in the Lowenbrau Classic at Road America, Elkhart Lake, Wisconsin.

Amoco/Polimotor Lola T-616 in action at Lime Rock, Connecticut, powered by a 168-pound "plastic engine", containing 59 TORLON parts.



Performance benefits of TORLON automotive parts

Redesign for additional weight savings.

Reducing mass reduces loads throughout an engine, permitting redesign of structural members in the chassis and suspension, which cuts weight further.



Reduced mass of TORLON power train components decreases parasitic power loss. Left to right: piston with TORLON skirt, #2 piston ring, connecting rod, TORLON wrist pin in metal sleeve.

More power

An important benefit of lighter weight is reduced inertial mass. The Polimotor engine develops more horsepower at a given engine speed, because lighter parts reciprocate more efficiently.



TORLON valve train components are wear resistant and have lower inertial mass than metal parts.

Valve float less likely

Reduction of mass in the valve train decreases the probability of valve float, a condition where the dynamic inertia of the system overcomes the positive displacement of the valve spring, causing the valve to remain open momentarily. The corollary of this: if the spring load remains the same, the plastic valve train can be operated at a higher speed for faster engine response with less chance of valve float.

Power transferred more efficiently

Reduction of mass in the valve train and power train reduces the dynamic forces and parasitic power losses associated with reciprocating components. With polymeric components, less power is lost to friction and secondary shaking forces.

Noise abated; corrosion eliminated

Plastic parts operate more quietly than metal. TORLON automotive components will not rust or gall, as do metal parts.



At Western Michigan University, a 5 hp engine with TORLON power train components has run successfully for more than 700 hours on the dynamometer.

Possible weight savings using TORLON parts determined from developmental parts

Part	Material	Weight, g	% Reduction
Intake valve	steel	107	
	steel/TORLON	76	29
Tappet	steel	48	
	TORLON	19	60
Valve spring retainer	steel	18	
	TORLON	6	67
Piston	aluminum	500	
	aluminum/TORLON	230	54
Piston pin	steel	103	
	steel/TORLON	76	26
Piston ring	cast iron	18	
	TORLON	4	78
Rocker arm	aluminum	129	
	TORLON	93	28
Turbocharger wheel	aluminum	80	
	TORLON	40	50

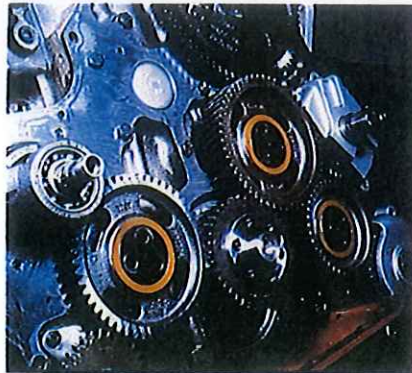
TORLON®

TORLON parts for other automotive applications

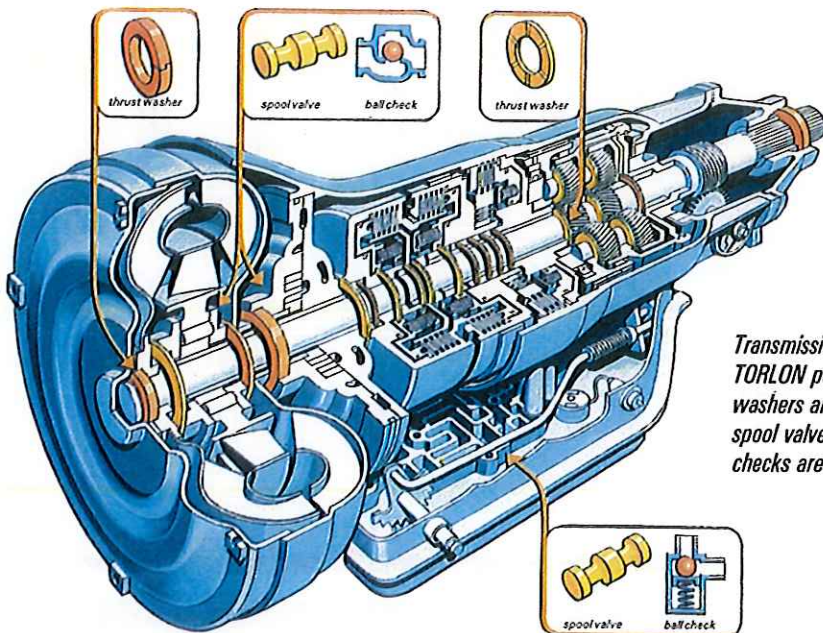
TORLON polymers are highly resistant to wear and fatigue, which led to the successful commercial development of TORLON thrust washers for heavy-duty engines. TORLON thrust washers have been used in trucks and off-road vehicles since 1979, and have been proven more reliable than the metal parts they replaced.

In transmissions, TORLON seal rings have been highly successful, because they provide a positive seal. The material's high compressive strength and wear resistance make it an ideal material for ball checks and spool valves, which are currently being developed for

passenger car transmissions, and thrust washers, which are produced commercially for transmissions of off-road heavy equipment.



A leading manufacturer of heavy-duty truck engines found that TORLON thrust washers last longer than metal parts they replaced. Metal failed due to fatigue from localized impact; TORLON parts absorb impact energy.



Transmission parts made of TORLON polymer. Thrust washers are commercial; spool valves and ball checks are developmental.

Amoco is your source for TORLON parts

Amoco can help you from concept through commercial production. Take advantage of our experience in designing and fabricating TORLON parts. Call us at 800-621-4557, or write to us at the address below.



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