Technology Today

Alan Pierce

Building the C5 'Vette Using Water and Balsa Wood

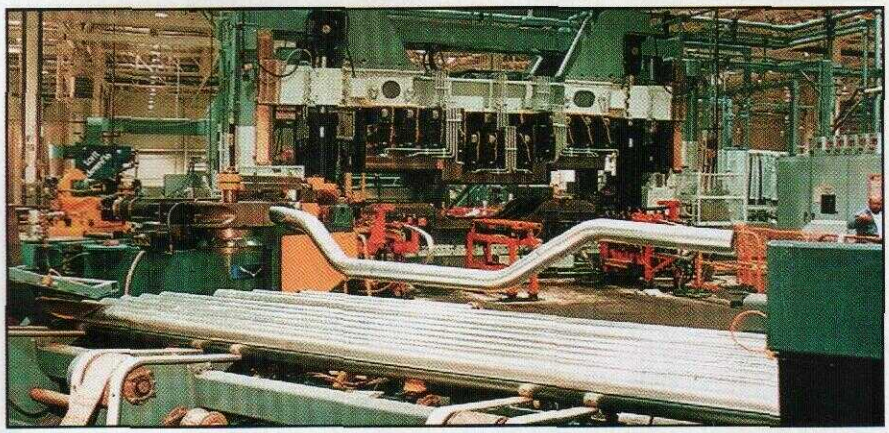

Photo 1. The process of hydroforming steel tubes begins.
Photographs courtesy of General Motors' Chevrolet Division.

What do the Grand Canyon and the new fifth-generation Corvette have in common? Their structures were both partially formed by the physical action of water.

What do your model plane, boat, or dragster problem-solving activities have in common with the new C5 Corvette? They are all built using balsa wood as a structural material. Can you believe that Chevrolet's Corvette structural engineers have found a way to build a stronger, lighter structural element for the new C5 using balsa wood? In this month's column we will see how cutting-edge technologists use balsa and pressurized water to form different structural sections of America's most popular sports car.

To build a very strong lightweight floor,

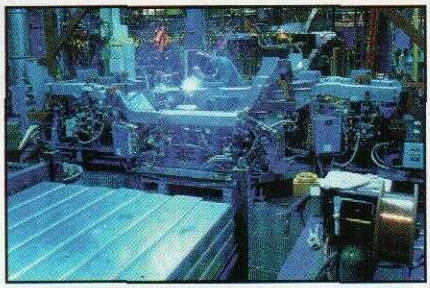

Photo 2. Under tremendous pressure, forced water shapes the steel Into a strong rail.

Corvette's structural engineers developed a sandwich that consists of an outer layer of SMC fiberglass bonded to an inner layer of balsa wood. This balsa composite is 10 times stiffer than any synthetic filler composite that the engineers tested. The balsa also serves as a natural vibration and noise filter, so balsa is now packed into the floor pan of all new 'Vettes.

If you squeeze water it squeezes back with equal pressure in all directions. Blaise Pascal discovered this attribute of water in the 17th century. The industrial process of forming materials by water pressure is called hydroforming, a process

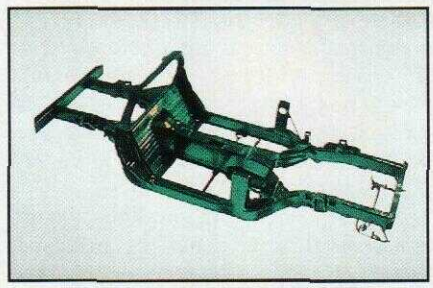

Photo 3. Finished hydroformed Corvette underbody.

that has played a role in manufacturing for at least a half a century. Hydroforming has probably been used to shape materials long before people understood Pascal's Law, which is the science behind this technology.

The use of hydroforming will expand dramatically if other automobile manufacturers adopt GM's innovative approach to building automobile side rails. Current frame construction technology revolves around constructing individual sections that are welded together to form the two side rails.

The earlier model Corvette used 28 sections to form the two side rails of its frames. Photo 1 shows tubes of steel that are about to be hydroformed into a one-piece rail that will contain approximately 14 different rectangular shaped sections. The tubes shown in Photo 2 are first capped and then placed into a 200 ton press. Once secured in the press, water and lubricant are pumped into the tubing under enough pressure that the walls of the tubing expand and take the exact rectangular shapes of the dies in the press. This hydroforming process is fast and produces a seamless, stiffer, lighter, and stronger rail. Photo 3 shows the completed underbody structure of the frame with the side rails in place.

Recalling the Facts

1. Describe how water is used to form the Corvette's side rails.
2. How were these side rails produced in the past?
3. Why do you think the structural engineers tried balsa as the center core of their floor board? TD

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