Manufacturing a New Cylinder Head!

By Bill Allard

Over a year ago, I began the process of making a new aluminum cylinder head for a mid-1930s vehicle who's original head had deteriorated from electrolysis and corrosion. New heads are unavailable and used heads suffered from the same problems, so the only option for obtaining a serviceable head was reverse engineering the original to create a new copy.

The process began by making a 3D X-ray scan of the old head and transferring the scan data into digital format which would be used to create the patterns for both the outside shape and the internal water cavity (core). This required refinement of the scan data; including allowing for shrinkage of the aluminum in the casting process.

A company in Tacoma CNC-machined the pattern for the outside shape from high density synthetic material. This pattern was used to make the traditional sand mold for the exterior of the head *(Pic. #1: machining the head pattern.)*

The core pattern was 3D sand-printed, and inserted directly inside the final mold. It was flushed-out with hot water after the casting was completed, leaving an area in which engine coolant will circulate. *(Pic. #2: pattern on right; core shipping container being opened on left. Pic #3: printed core removed from shipping container.)*

The final step was machining details to match the original. *(Pic. #4: machining the casting.)*

Pic. #5: finished head.