

# Laser Rapid Prototyping Manufacturing of Complex Shape impellers

## 1 Introduction

Complex shape impellers are a typical kind of parts composed of free surfaces which have a long manufacture period and high cost made by traditional technics. For examples, an aluminium alloy impeller with a diameter of  $\phi 410\text{mm}$  and a height of 150mm milling with five shafts NC miller will cost 40,000 RMB yuan, and a stainless steel one will cost 70,000 RMB yuan, both of them need 20•30 days. The ability of turning complex CAD model into physics model of Rapid prototyping manufacture, enables it to be perfect in processing complex 3D objects in tens of hours at the cost of thousands of RMB yuan.

## 2 Pocess

First, measure the impeller with 3 coordinate measurer to make a set of random data. Second, build its CAD model with the surface reconsturcting system designed by ourselves and then process the data and program the process with Larc'98 (RP-CAPP system) of Yinhua co. Last, produce the impeller with SSM method on M-RPMS-III machine made by Yinhua.

## 3 Specification of the equipment and process

Impeller diameter:  $\phi 410\text{mm}$ , height 150mm. Scanning speed: 300mm/s, gridding line speed: 500mm/s. CO<sub>2</sub> laser power: 35W, this will change according to the speed in processing. Coated paper: YHCP-1004 made by Yinhua Co. Press temperature: 90•. Thickness of paper with glue: 0.1mm. Processing time: 30 hours per impeller.

## 4 Production

3 complex shape impellers were made in Yinhua co in August in 1999 for Sichuan Kongfen (group) Co. Ltd, Sichuan Institute of low cooling equipment• fig 1, 2 show the CAD model and SSM prototype with clear contour, high surface quality, steady dimensions.

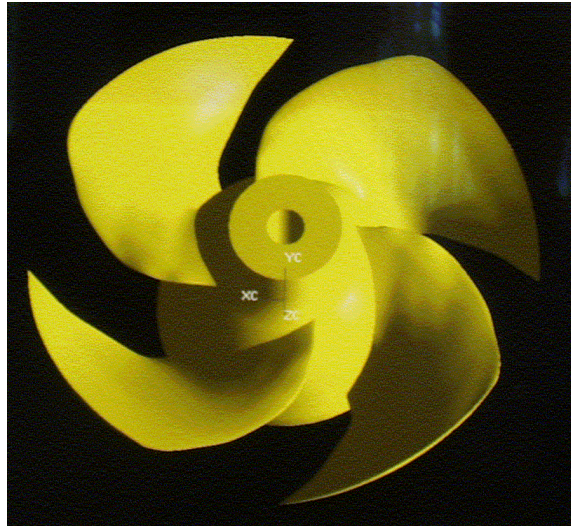


Fig 1 CAD model of the complex impeller

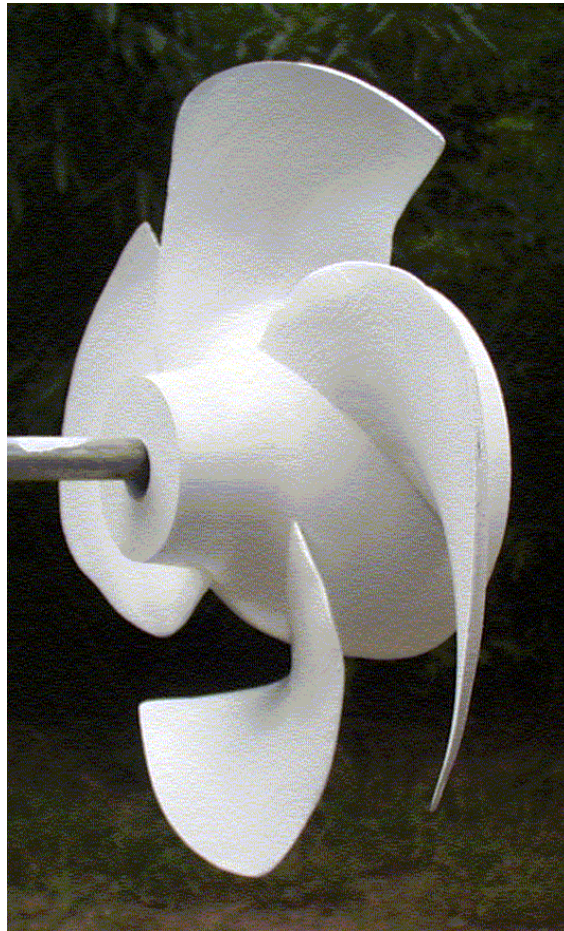


Fig 2 Prototype of the impeller with SSM method