to realize the coexistence of target element $G_1$ and $G_2$. Next we should make sure that the diameter is constant. In order to meet the design requirement of function domain, we can shorten the length of principal axis and increase diameter of canter hole within the requirement of physical element. Then the principal axis that meets the demand of function domain and physical domain can be obtained by calculation of structural strength. And it is:

$$R_{n+1z} = \begin{bmatrix} Spindle & Meterial & Forge\ 20SiMn \\ & Length/mm & 7700 \\ & Axis\ Body\ Diameter/mm & \phi 2050 \\ & Centre\ Hole\ Diameter/mm & \phi 1715 \end{bmatrix} \quad (14)$$

The size of wheel is:

$$R_{n+1zl} = \begin{bmatrix} wheel & Nominal\ Size/mm & 6265 \\ & Maximum\ Overall\ Diameter/mm & 6360 \\ & Inner\ Diameter/mm & 3130 \end{bmatrix} \quad (15)$$

The designer of turbine engineer can design the size of flange and other parts based on the obtained size of principal axis and wheel.

## 6. CONCLUSION

This paper aims at extension adaptive design for the whole lifecycle of mechanical product with characteristics of multi-level, multi-attribute, creative and complexity. We study the knowledge reuse and extension design model in the extension adaptive design for the whole lifecycle of mechanical product, and give an improved to compute similarity based on extension distance. The method avoids similarity changes when add or delete data in a database. And it will not be affected by whether the most advantage point is in the midpoint of the interval. So it is more generality. Meanwhile, we expand the design domain for the adaptive design of mechanical product, and give the extension model and extension principle of the conflict problem which exist within or between each design stage. Then the model of extension adaptive design for the whole lifecycle of mechanical product is proposed.


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