components for optimization object when performing structural optimization[6].

B. Structural Optimization

According to the left side wall outer panel, the right side wall outer panel, the roof outer panel and so on, we create the design variables, and according to the constraints variables and objective function, the structure of the cab is optimized by the use of OPTISTRUCT solver. Based on sensitivity analysis results and iteration calculation results, each structure optimized thickness is obtained, and then combined with the actual situation in the production process, and thus to re-determine the thickness of each structural of the cab[7]. The optimization results of cab structure are shown in Table Ⅲ.

TABLE Ⅲ THE OPTIMIZATION RESULTS OF CAB STRUCTURE

Variable number	Initial value （mm）	Optimized value （mm）	determined value （mm）
D27	1.60	1.76	1.80
D2	0.80	0.95	1.00
D17	1.20	1.47	1.50
D12	0.80	0.96	1.00
D56	0.60	0.81	0.80
D19	0.80	0.97	1.00
D37	0.80	0.96	1.00
D30	0.80	0.96	1.00
D49	1.00	0.84	0.80
D43	0.80	0.64	0.60
D21	1.20	0.97	1.00
D30	1.50	1.23	1.20
D50	1.50	1.18	1.20
D8	1.20	0.98	1.00
D5	1.00	0.82	0.80
D25	1.20	1.03	1.00

After the finally optimization of the cab, the modal analysis is carried out again, the results compare with before optimization results, comparative results are shown in Table Ⅳ.

TABLE Ⅳ RESULTS BEFORE AND AFTER OPTIMIZATION

contrast parameters	before optimization	after optimization	variable quantity
total mass（kg）	170.8	172.5	0.99%
first order modal frequency（Hz）	22.17	19.98	-9.88%

As can be seen from Table Ⅳ, through the modal sensitivity analysis of structure optimization, although the total mass of the cab increases slightly, but the total mass of the amount of change is less than 5%, the amplitude is relatively small. After optimization, the first order modal frequency is reduced from 22.17Hz to 19.98Hz, compared to the excitation frequency of the engine idling, it staggers 3.32Hz. Thus away from the excitation frequency of the engine, the generation of the resonance can be effectively avoided.

IV. CONCLUSION

In view of the first torsion frequency of the light truck cab is close to the engine idling excitation frequency, the finite element model of the cab is Established, and then modal sensitivity analysis is carried out, the three sensitive components are found, at the same time, the structure of the cab is optimized, making the optimized cab meet other performance conditions, its first order torsion frequency and the engine idling excitation frequency stagger 3.32Hz. In this case, the resonance is avoided, the purpose of vibration and noise reduction is achieved to some extent, and also the ride comfort and safety are improved.

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