with the increase of contact angle β. On the contrary, with the reducing of contact angle β, the bearing capacity of screw descend, in addition, the service life of products is affected as radial force increasing. Therefore, Taking the beneficial of transmission, bearing performance and the fluency of ball into account, we often adopt β=45° as the standard of contact angle at home and abroad.
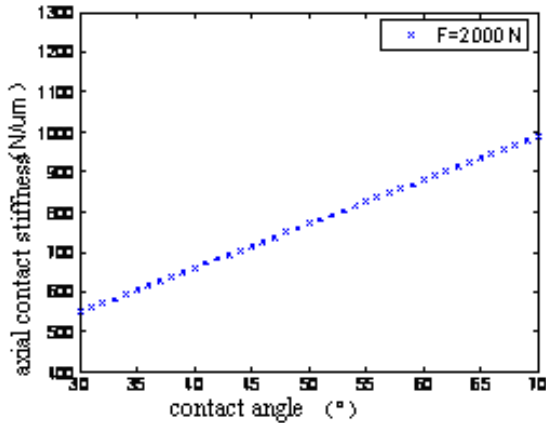

Figure 4. The influence of contact angle on the double-nut ball screw stiffness

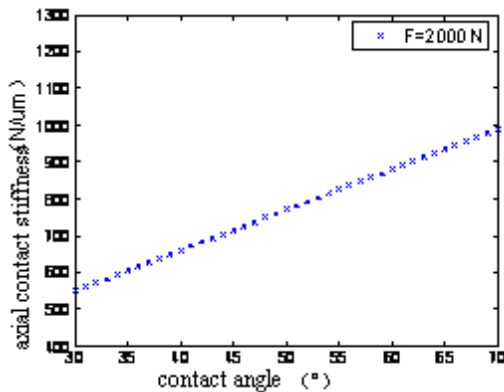*4) Influence of helix angle on the double-nut ball screw stiffness*

Figure 5. The influence of Helix angle on the stiffness of double-nut ball screw

Helix angle is one of the most important parameters of the high-speed ball screw. In order to adapt to the requirement of high speed, most of the high-speed ball screws has large pitch, which it is achieved by increasing the ball screw's helix angle. It is essential to consider the ball screw stiffness impacted by helix angle in the design process of high-speed ball screws. Taking the preload 2 KN, the change trend of axial stiffness with the helix angle to increases from 4 ° to 25 ° is shown in Fig. 5.

From the fig.5, it can be seen that the axial stiffness goes up with the increase of helix angle obviously, and the increase of helix angle also improves the feed speed of the screw. However, it will also increase lead error of ball screws and difficult of the high precision feed. So the proper enlargement of helix angle can improve ball screws stiffness and feed speed under the consideration of accuracy.

III. CONCLUSION

According to the above analysis of the influence on the axial stiffness of ball screws, the following conclusions can be drawn:

Contact angle and preload have great impact on axial contact stiffness of the double-nut ball screw, the stiffness of ball screws can be improved obviously by increasing the contact angle or the proper enlargement of preload, but too big preload or contact angle will also intensify the wear in the operation process. The increasing of helix angle will improve the axial rigidity of ball screws, at the same time; it will also improve the feed speed and meet the requirements of high speed. The conclusion can be also applicable to other types of ball screws; it provides a theoretical reference for the optimization design of new ball screws.

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