

Designing of Face Gear Drive with a Small Gear Ratio

6

Researchers: Yi-An Chen, Chih-Chieh Fan
Advisor: Shyi-Jeng Tasi

Introduction

The face gear drive can be applied for transformation of rotation between intersected and crossed axes such as the differential of the car, wind plate, monorail and the helicopter. With the point contact, the face gear drive would be less sensitive to misalignment. In order to solve the problem for the limitation of the face width under the small gear ratio, we first use the non-basic rack and then use the non-standard gearing that the gear pair with different pressure angle and the different modules to solve the problem.

Face Gear 3D Model

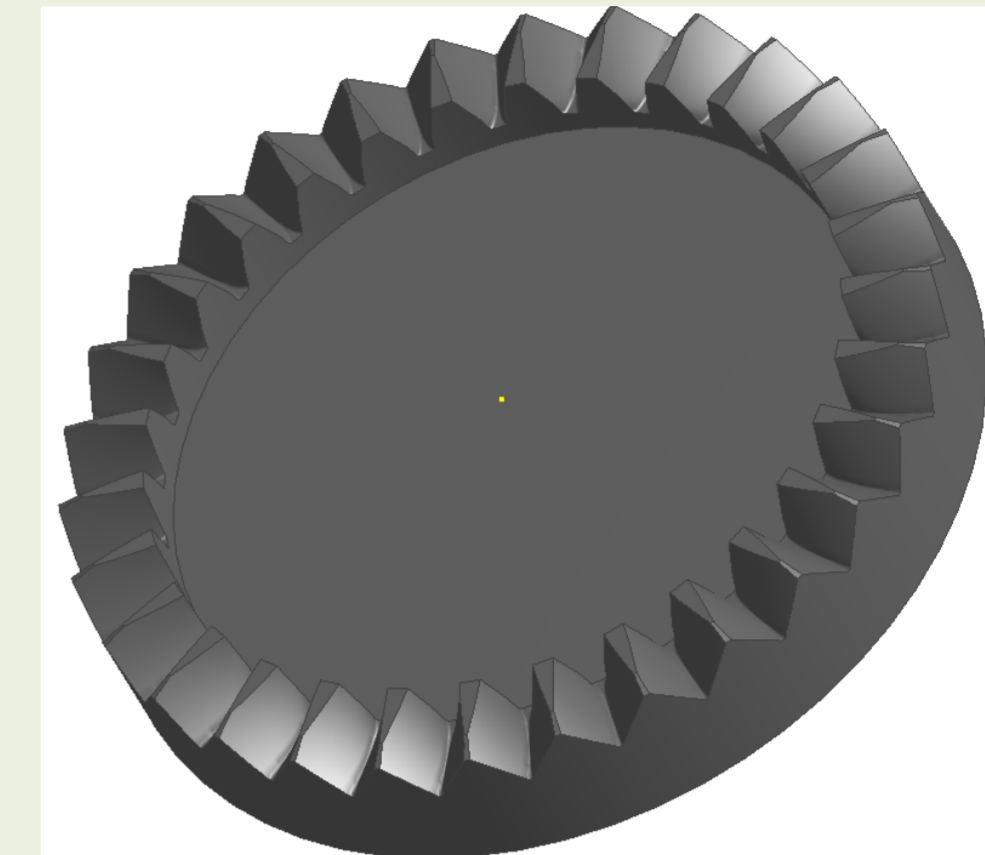


Fig.1 Face gear 3D model

Limitation of Geometric

While manufacturing the face gear, it's easy to cause the inside diameter undercutting and outside diameter pointing. The effective face width will be reduced by the limitation.

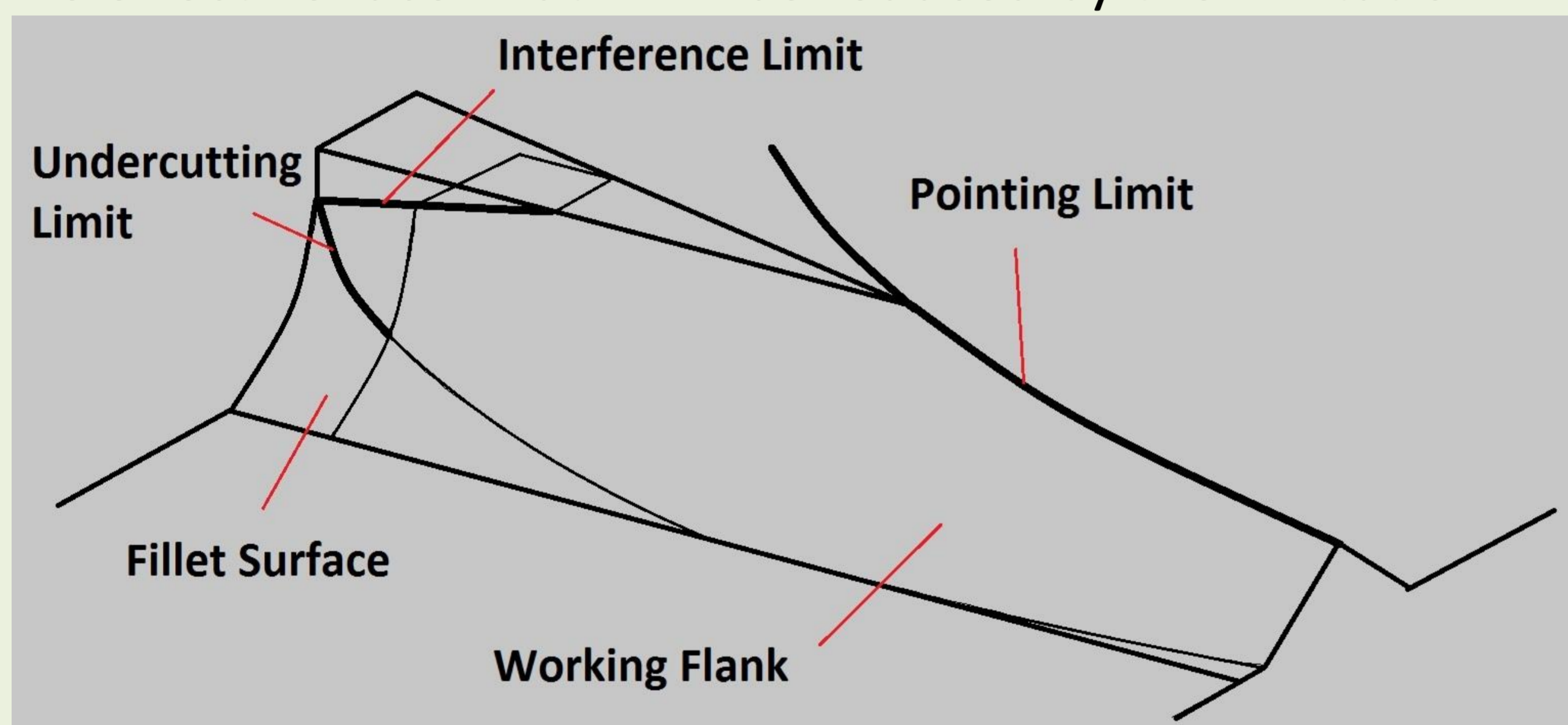
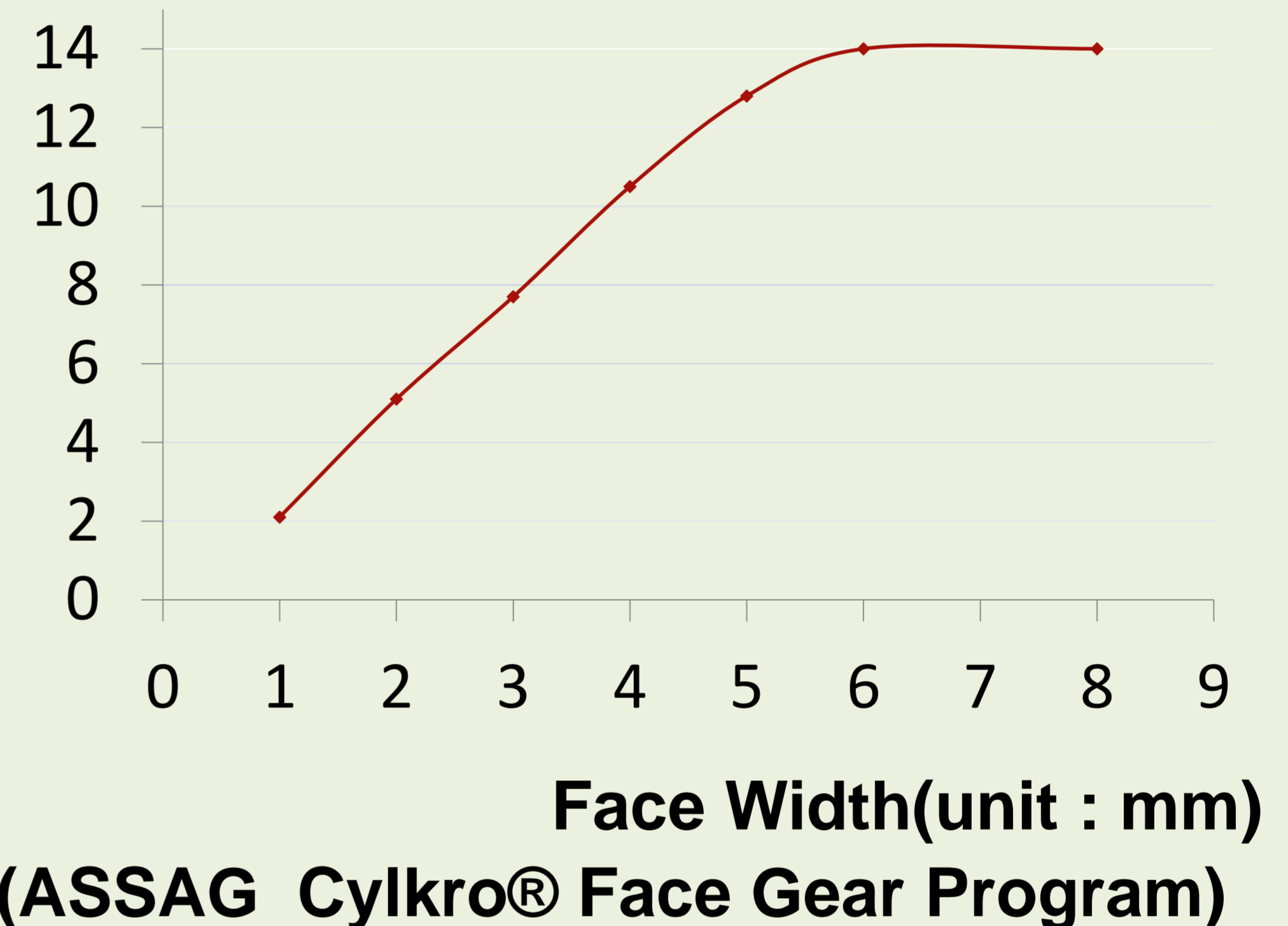


Fig.2 Limitation of Geometric (Shyi-Jeng TSAI, 2001, *Geometrical Design of Face-Gear Drives For Power Transmission*)

Gear ratio

The face width varies as the gear ratio. The smaller gear ratio it has, the smaller face width it has.

Gear ratio ($m_n = 1$)



(ASSAG Cylkro® Face Gear Program)

Design parameter

Gear ratio $\frac{z_f}{z_p} = 1.5$;

Tooth number of the pinion is 20

	Face gear
Tooth number (Z_f)	30
Ri (minimum gear radius)	44.6042
Ra (maximum gear radius)	53.5528
R1	45.3883
R2	56.6893

Interference Analysis

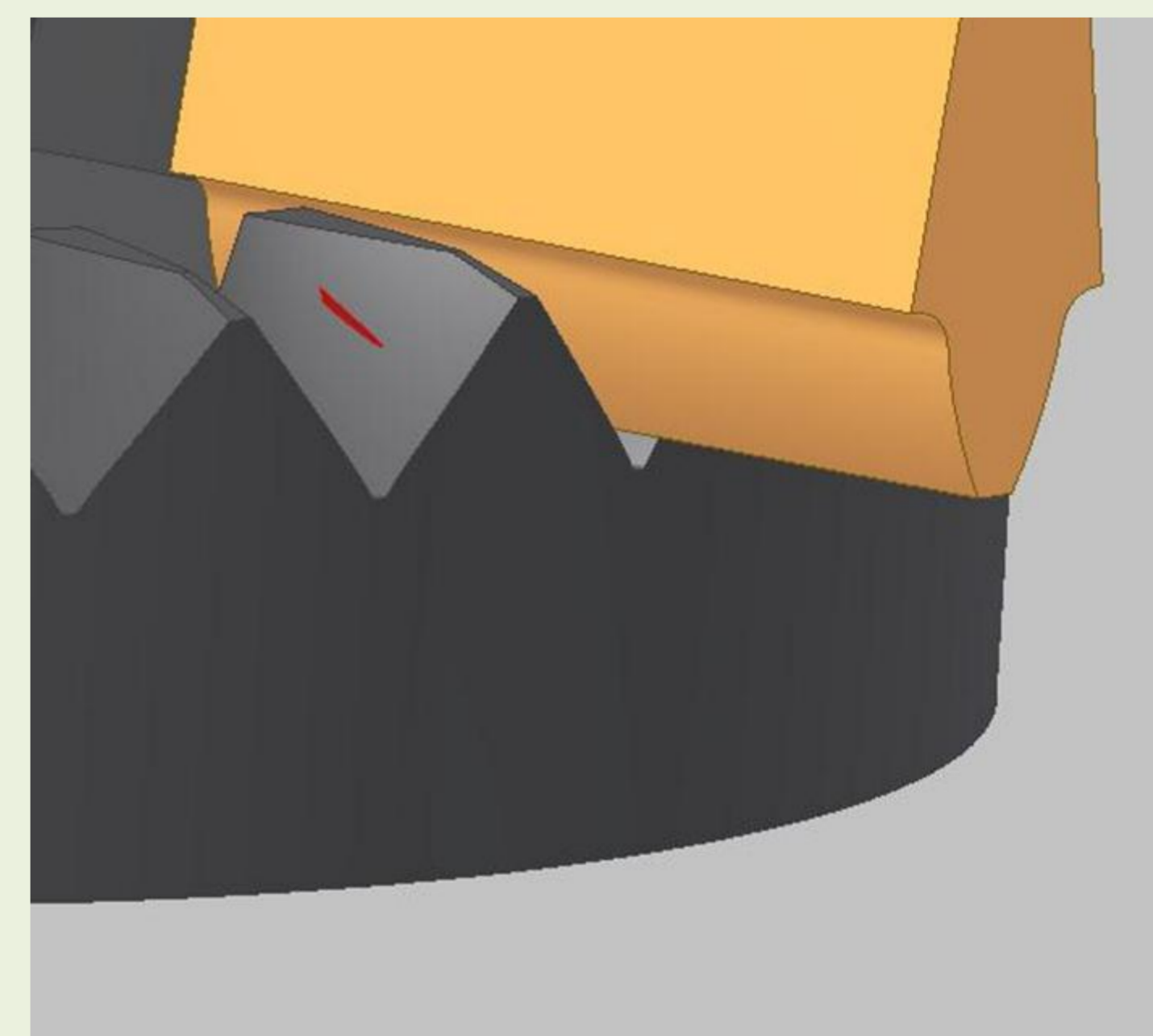


Fig.3 The mesh area between the face gear and pinion

Results

1. We use the non-basic rack and the non-standard gearing to avoid the problem.
2. The result of the face width is more larger than standard manufacturing.
3. By the interference analysis of the face gear and the pinion, we can checking the mesh area