

# Practical Method of Conical Cam Outline Expansion

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**Abstract:** Conical cam mechanism has been widely used in modern machinery and equipment. However, the commonly used planar expansion methods for the design of spatial cam contour produce significant errors, because these methods incorrectly use the distance from the axis of the follower to the main conical cam to replace the corresponding arc length on the conical cam. HSIEH, et al, used analytical methods to achieve higher accuracy, but these analytical methods have their own drawbacks since they are too complicated for practical use. Through the analysis of the errors created during the generation of conical cam contour using the existing expansion methods, this paper proposes to include diverge angle in the calculation of conical cam rotation angle in the equation of conical cam contour expansion. This correction eliminates the error generated by the commonly used methods. Based on the expression of the follower's 3D trajectory and the spatial geometry of conical cam, this paper has deduced the planar polar curve equation for determining polar coordinates for the curve of planar expansion outline. Furthermore, this paper provides an example of conical cam contour design based on sinusoidal acceleration variation. According to polar coordinates and the movement of curve equation function expression, this paper applies MATLAB software to solve coordinates for the cam expansion curve and use AutoCAD software to generate conical cam expansion contour that meets the requirement of the law of motion. The proposed method provides a design process that is simple, intuitive and easy to master and implement. It also avoids the design error in the traditional methods for generating contour of conical cam with oscillating follower that requires high precision.

**Key words:** oscillating follower, conical cam, 3D expansion, polar coordinates, curve equation

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