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Aspheric lens mould design correction

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This technical note introduces a newly developed software utility, known as 'Aspheric Lens Mould Design Correction'. It is built for use in moulding optical industries for the new design of aspheric moulds using lens/mould surface measurements. It also contains other useful features for further understanding of the lens/mould manufacturing process.

Introduction

Quality control of moulded optics is important for the moulding optical industry. Considering the large volumes produced, inspection of each individual lens is not always realistic due to the time, costs and difficulty involved in small lens measurements. However, lens moulding is a replicative process that allows the production of high precision optical components from glass/plastic without grinding and polishing. Therefore, it is possible to optimise the complete process chain by only inspecting selected lenses/moulds.

Due to the common types of aspheric lens moulds used in moulding optical industries, the software tool **'Aspheric Lens Mould Design Correction'** has been developed to meet the expectations of various moulding optical industries. It gives a deeper understanding of the lens manufacturing process and efficiently controls the quality of optical lenses.

Features of the software utility (see Fig. 1)

1. Analyse the mould/lens form error E1 (mould vs mould design) and E3 (lens vs mould design).
2. Calculate the developed form error from the mould to the moulded lens (Error difference E2).
3. Get the corrected design of the mould from the test data of the mould/lens.
4. Decomposing the residual (form) error to symmetrical or/and asymmetrical error components to further understand the developed error from the manufacturing process of mould/lens making in more detail.

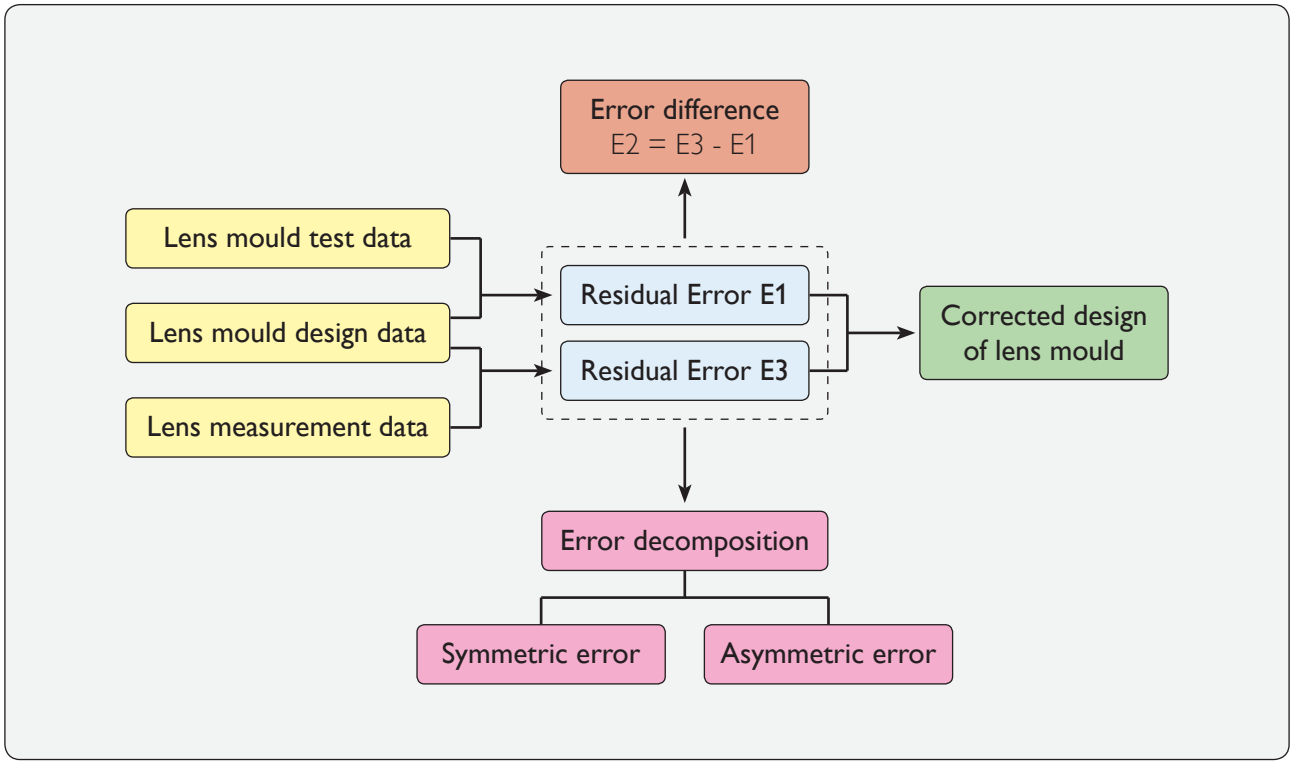

Figure 1 - Aspheric lens mould design correction

Unique comprehensive analysis (See Fig. 2)

For analysing the form error of the aspheric mould/lens; it does not only cover the conventional aspheric design but also covers the popular Q-bfs and Q-con aspheric designs.

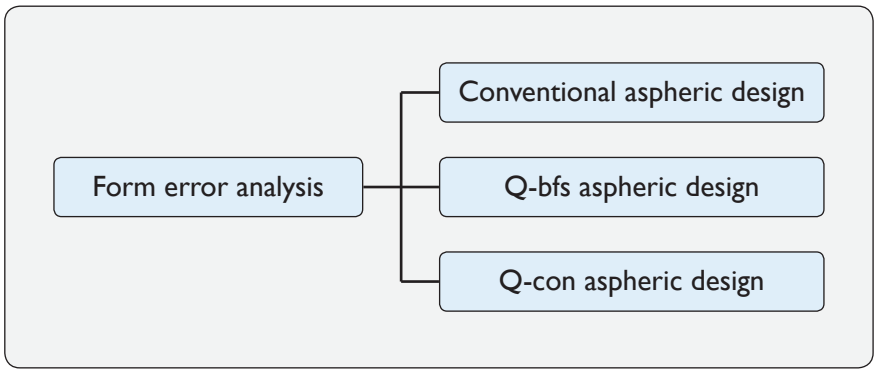

Figure 2 - Comprehensive analysis

Overview of the software utility (See Fig. 3)

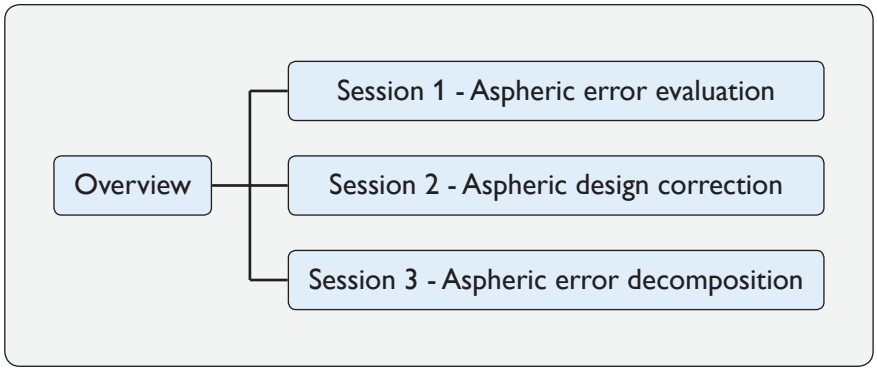

Figure 3 - Comprehensive analysis

Session 1 - 'Aspheric error eval' (See Fig. 4)

Calculates the residual error of the aspheric mould/lens and the developed error from 'mould' to 'lens'.

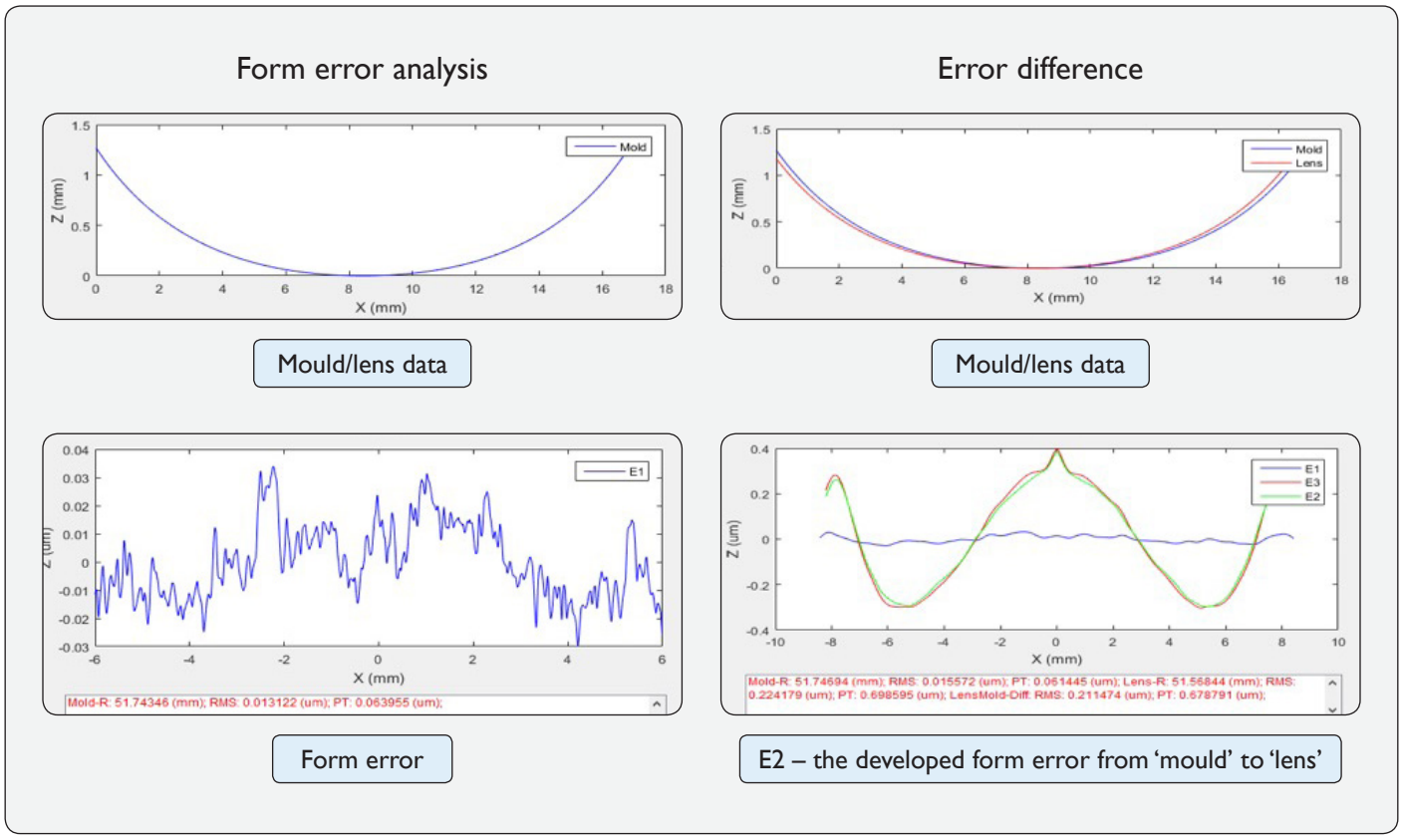

Figure 4 - Form error and Error difference analysis (Session 1)

Session 2 - 'Aspheric design correction' (See Fig. 5)

- Calculates the corrected design of mould using the test data of the mould/lens.
- Shows the residual error vs the corrected design of mould.

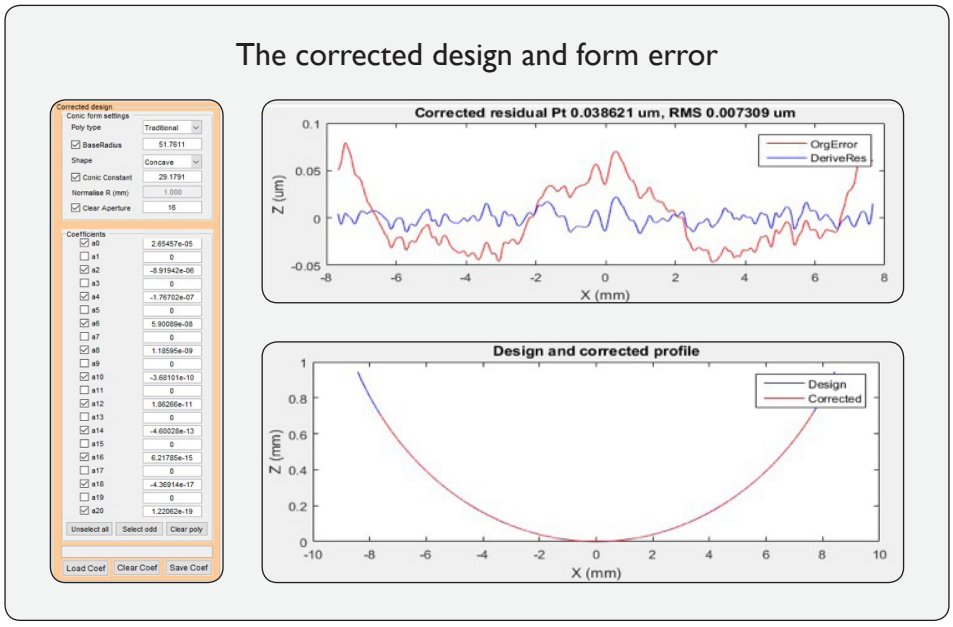

Figure 5 - The corrected design of mould and the form error of lens/mould used for correction

Session 3 - 'Aspheric error decomposition' (See Fig. 6)

The form (residual) error can be further decomposed into symmetric and asymmetric error components in either 'Traditional' or 'Chebyshev' polynomials, in order to help the optical manufacturer to understand the error source and therefore to control the quality of the optical lens.

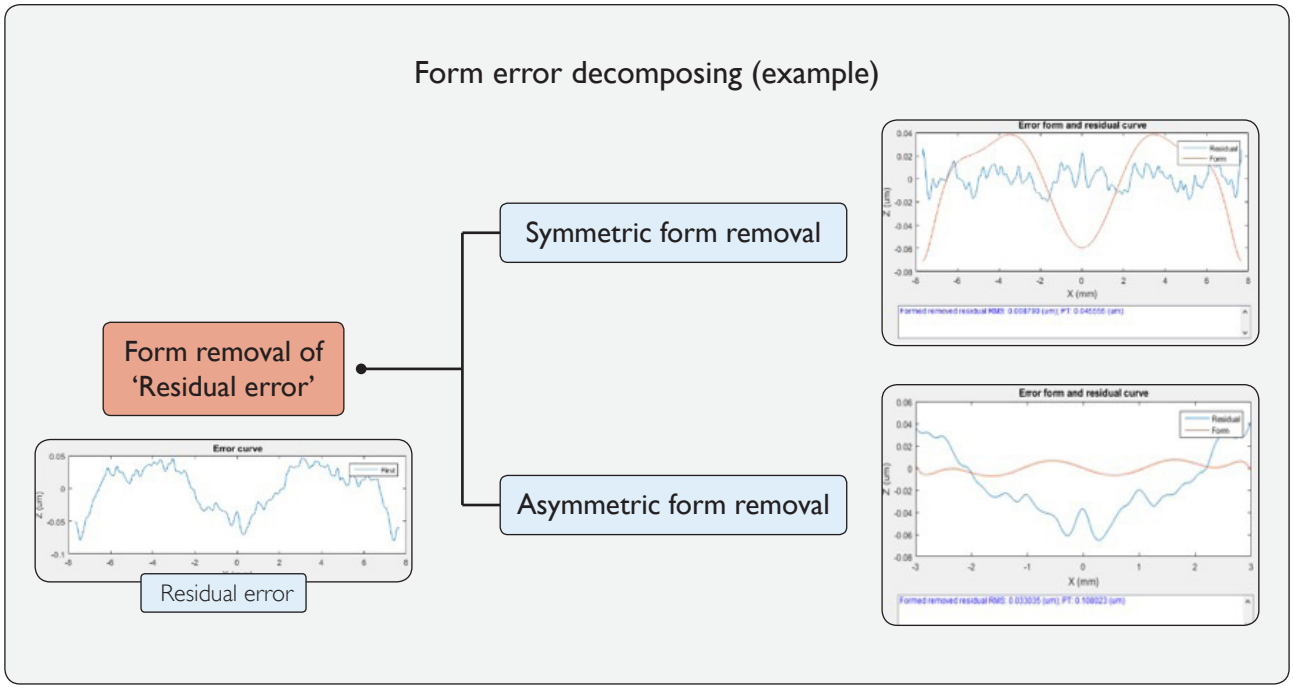

Figure 6 - Form error decomposing

Summary

This software tool not only covers the basic requirements of the moulding optical industry but also provides more features useful for the optical designers, the manufacturing engineers and the metrologists. It helps the moulding industry to understand the manufacturing process in more detail, in order to improve optical performance efficiently and with lower costs.

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