

PANDAO
FROM OPTICS TO FABRICATION

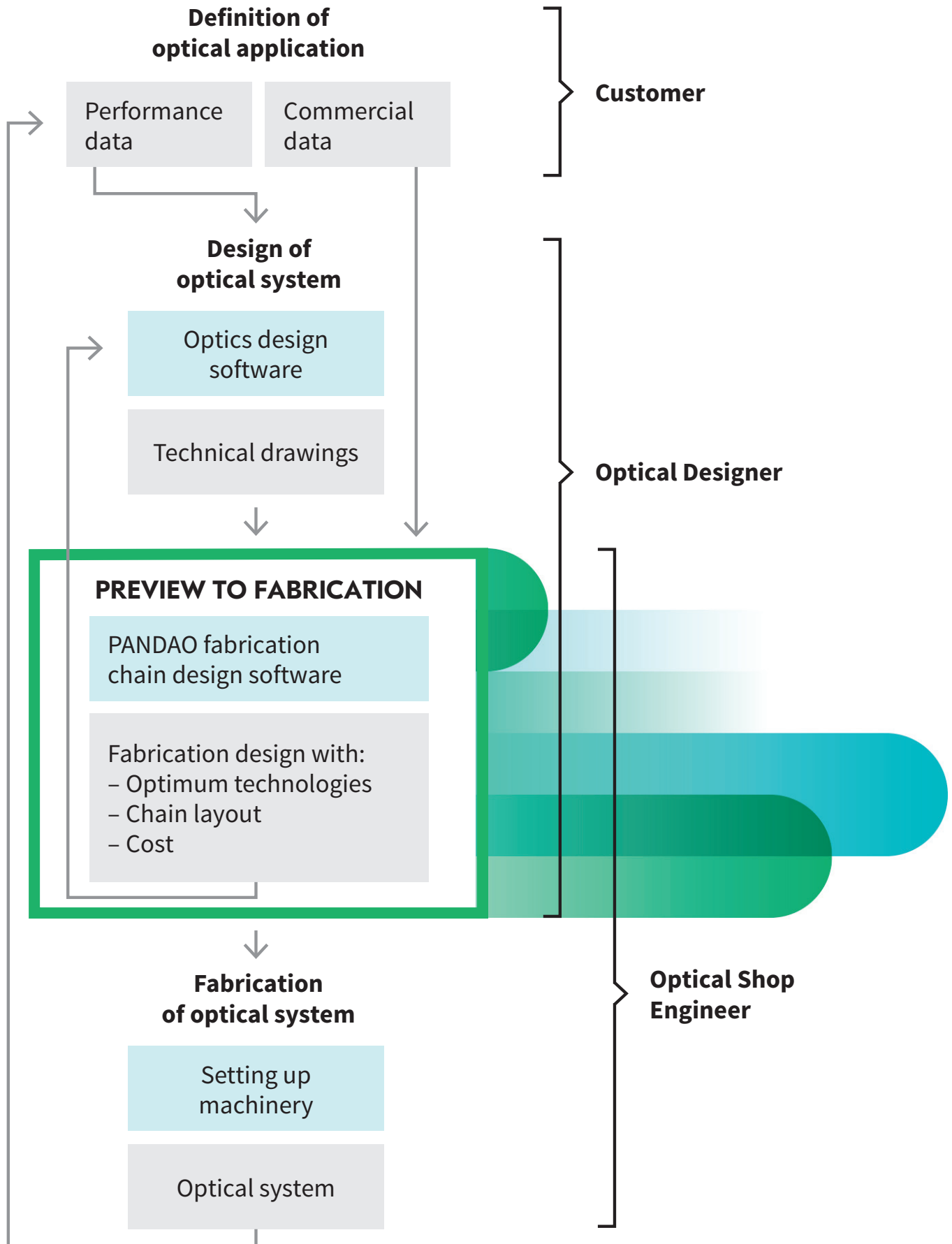


OPTIMIZE YOUR OPTICS DESIGN FOR FABRICATION

PANDAO is a software tool linking the needs of optical design and fabrication, enabling a preview to producibility of optical elements during the design stage. It delivers the cost impact of lens parameters and tolerances and takes all existing optical fabrication technologies into account. That way, PANDAO designates the optimum fabrication chain, including fabrication cost, centering cost, testing cost and coating cost.

Consequently, PANDAO helps to design optical elements for minimum fabrication cost by delivering the optimum fabrication chain for your or your suppliers production facility.

THE EVOLUTIONARY STEP BY LINKING OPTICS DESIGN TO FABRICATION



USING PANDAO AS A TOOL IN OPTICS DESIGN

Input needed

- Lens data and tolerances as received from optics design software
- Commercial details of production order (e.g. number of lenses to be produced)

Output generated

- List of essential optical fabrication techniques to be applied
- The optimum fabrication chain
- Fabrication cost, centering cost, testing cost and coating cost information

PREVIEW OF PANDAO OUTPUT

Best fabrication chain

	Stage 1:	Stage 2:	Stage 3:	Stage 4:
Side 1:	cnc sub aperture rough grinding fabrication price 6.33€	cnc sub aperture grinding fabrication price 21.58€	ccp bonnet fabrication price 66.14€	
Side 2:	curve generator rough grinding fabrication price 2.30€	cnc full aperture flats grinding fabrication price 5.53€	cnc full aperture flats polishing fabrication price 6.37€	overarm polishing fabrication price 1.21€

Total fabrication cost for this lens: 109.45€.

Investbudget for installing machinery for this fab-chain: 820000€

Centering

best centering process: centeringCNCTransferMandrel
centering cost for this lens: 3.52€
investbudget for installing centering machinery: 100000€

Coating

coating cost for this lens: 0.00€
investbudget for installing coating machinery: 0€

Testing

testing cost for this lens: 10.73€
Minimum testing equipment needed for this lens: Mirometers, flowboxes, ring-spherometers, microscopes with size-analyzing software, hand-hold Profilometer, various testing equipment (magnifying glasses, skale, heating tables, USB-microscopes, pH-value testing device, etc), laser sheet diameter testing device, Refractometer, CMM. wavefront testing interferometer, white light interferometer, standard Profilometer, Nomarski microscope, ScratchDig-detection apparatus, MTF testing device CGHs, high-end Profilometer

Disclaimer

cost calculations representing an average-sized European fabricating company, including: machining, tooling, operator, centering, testing, coating, setting-up, machine's invest cost, bank payback time, interest, operators salaries, two-shift fabrication, etc; excluding: material cost, companies' overhead, assembly and delivery cost

EXAMPLES FOR PANDAO RESULTS OBTAINED IN REAL OPTICS PROJECTS

Varying design parameters: asphericalCX_plano lens

Production order of 500 pcs of a convex plano-aspherical lens (220 mm diameter) made of glass. PanDao determines fabrication cost for this lens to be 158 € (= starting point):

- **Vario 1 irregularity:**
3/irregularity from 0.4 to 0.3 fringes? ccpBonnet moves out and ccpWheel followed up by ccpMRF moves in
179 € (13 % more expensive: 10'500 € extra cost)
- **Vario 2 mid spatial frequency:**
minimum mid spatial wavelength from 0.5 mm down to 0.2 mm? ccpBonnet stays but ccpIBF moves in
186 € (17 % more expensive: 13'780 € extra cost)
- **Vario 3 asphericity:**
asphericity from 4 um down to 2 um best-starting-sphere fabrication moves in
121 € (save 30% or 18'440 €)
- **Vario 4 curvature:**
smallest radius of curvature from 89 mm down to 83 mm
217 € (37 % more expensive: 29'300 € extra cost)

Comparing competing optical systems

Comparison of two optical system designs (batch sizes 100 pieces)

- An aspherical system, consisting of two lenses
(a plano-aspherical and a biconvex spherical lens):
total cost of lenses = 21 € per set
- A pure spherical system consisting of four lenses
(two biconvex and two meniscus lenses):
total cost of lenses = 15 € per set

Conclusion: the aspherical system is only 1.45 times more expensive than the spherical system but asphere technologies need to be invested in (ccpBonnet = 200'000€)

SUMMARIZED

PANDAO IS YOUR:

- **Preview to producibility of your lens design**
- **Way to valuable, state-of-the-art information about the production of your optical components's design**

PANDAO ENABLES:

- **Optics designers to design for optimum fabrication chains at minimum cost and delivery times**
- **Optical engineers and design-to-cost managers to choose optimum fabrication chains and to evaluate suppliers**
- **Production planners to search for up to date alternatives of optics fabrication techniques**

INTERESTED IN KNOWING MORE ABOUT APPLYING PANDAO FOR YOUR DESIGNS?

Your contact for further information
and demonstration:

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