

## Micro flat fan nozzles

**Customer:** IBAK Helmut Hunger GmbH & Co. KG

**Application:**

Cleaning nozzle for camera system of a pipe cleaning robot.

*(Product: Nanogator, Company IBAK)*

**Customer Challenge:**

New product development of pipe cleaning robot (planned paragraph 50 pcs/year).

Cleaning solution for camera system necessary.

Commercial flat spray nozzles not available in this small, compact design.

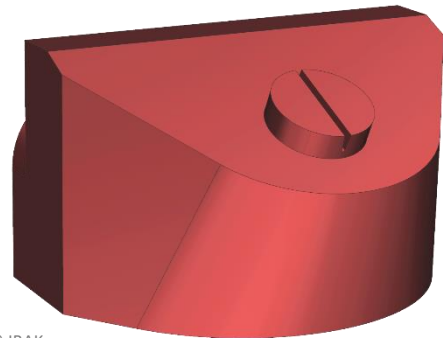
**Narrowest point** of the nozzle channel measures only **85 µm**.

Additional necessity of an **inclined nozzle channel**:

- Standard production by injection moulding technologically not possible
- Alternative subtractive production with special tools tested, but not applicable due to too high reject rates (approx. 50 %), because the resulting milling burrs interfere with the beam pattern
- AM solution already included in product development, development goal to produce nozzle additive



*Rinsing process of camera lens of the milling robot Nanogator*



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*Micro flat jet nozzle with nozzle channel of 85 µm*

**Material and process requirements:**

High demands on **resolution and edge sharpness** of the printed plastic components. Edge sharpness of the nozzle channel is decisive for the functionality of the nozzle. Water jet breaks off at a sharp edge and produces a perfect flat jet.

Component **permanently in contact with water** → low water absorption of the material and constant material properties required

Water temperature during **operation approx. 70°C**

Material must withstand stress from repeated temperature cycles

**Production scrap < 10 %**

## **Market Screening and Success:**

IBAK performed screening of various photopolymerization-based technologies.

- high resolution and edge sharpness only given with hot lithography processes
- Material shows low water absorption and consistent quality Long-term properties (test period > 1 year)

## **Production of parts:**

Producer: Cubicure

Machine: Caligma 200

Material: Precision SF (special formulation based on Precision)

Layer height: 20 or 50  $\mu\text{m}$

Annual requirement of parts: 500 pieces

Component size: 12 x 7 x 9  $\text{mm}^3$

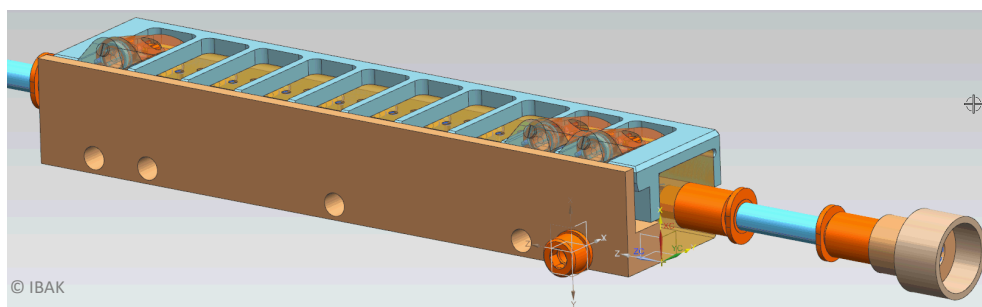
Amount of parts per printing job: 119

Production time per printing job: 26 h

Cleaning of parts per printing job: approx. 5 h

Number of design iterations: 4 within one year including design, manufacturing, Functional testing, and readiness for series production

Post processing: Special nozzle rinsing device serves to clean the nozzles from adhering residual resin and at the same time for quality control of the flat jet (each rinsing passage á 10 nozzles simultaneously)



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*Flushing device for nozzle cleaning and quality control*

## **Customer - Feedback:**

*"The combination of manufacturing precision, good material properties as well as fast and flexible production was the decisive reason for IBAK to use this technology for the series production of the cleaning nozzles for the new milling head".*

**Janina Galinski, Head of Marketing and Product Management at IBAK**