19th Seminar of Track Management
STRAHOS 2022

Geometry change in switch frogs

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Project
'Special Session and Workshop
on Seminar of Track Management STRAHOS'

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- Change of the service life
- Determination of the switch frog geometry
- Conclusions

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Introduction

- **Characteristic of the switch frog**
  - **Geometry change → Strain change ($\sigma = f(F, A_{contact})$)**

→ Service life ↑ ~ $\frac{\textit{Resilience (material)} \uparrow}{\textit{Strain (geometry)} \downarrow}$

  - **Profile – Individual progress**
  - **Form change → Deformation/Wear**

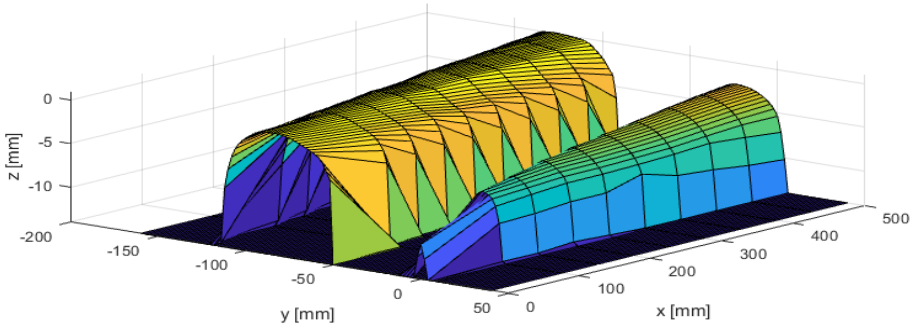

Figure 1: 3D-Modell [Kluge, F.]

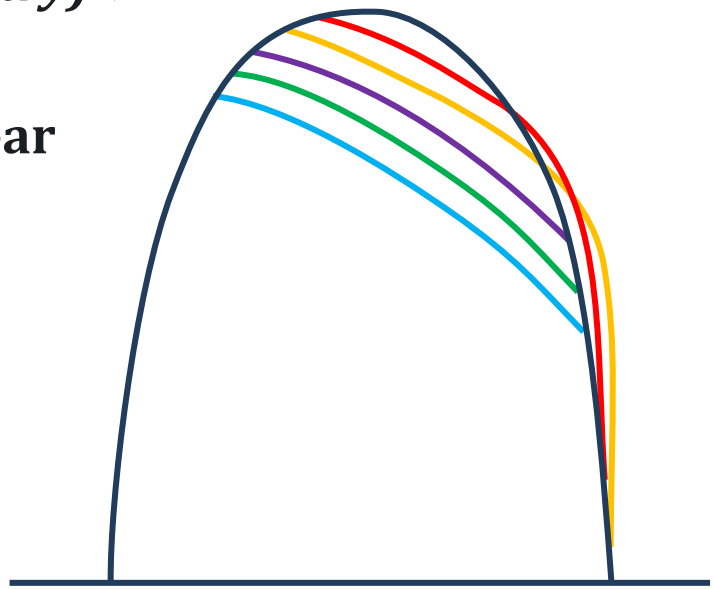

Figure 2: Deformation/Wear

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Introduction

- **Switch frog geometry**
  - **Top view**

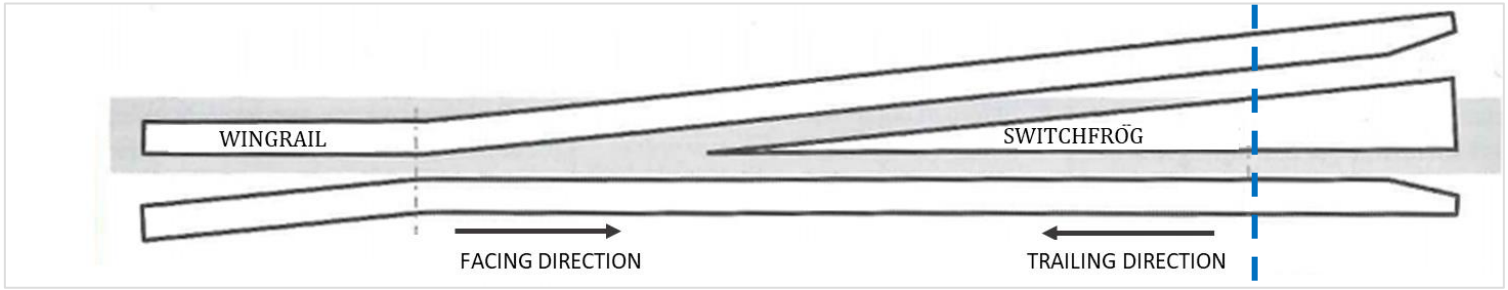

Figure 3: Top view [1]

  - **Cross section**

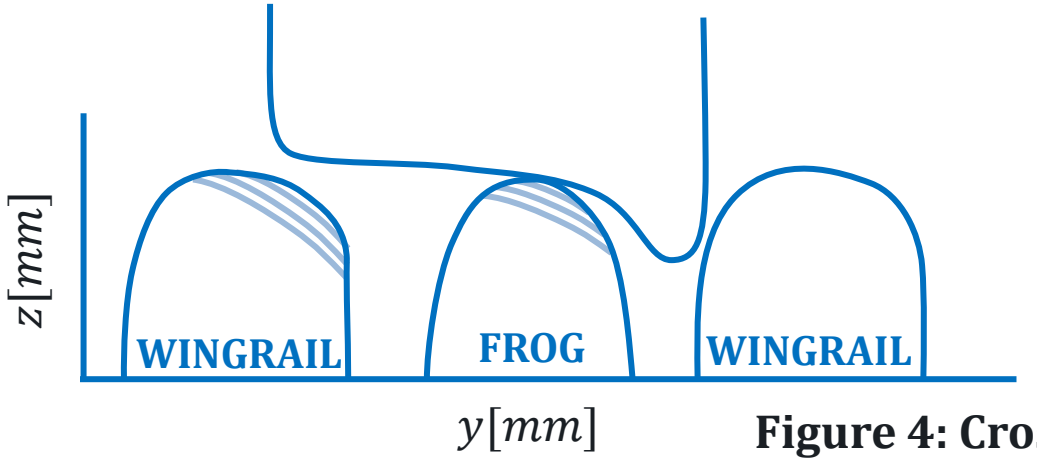

Figure 4: Cross section

Change of the service life

- **Service life ↑ ~ Resilience (material) ↑ / Strain (geometry) ↓**

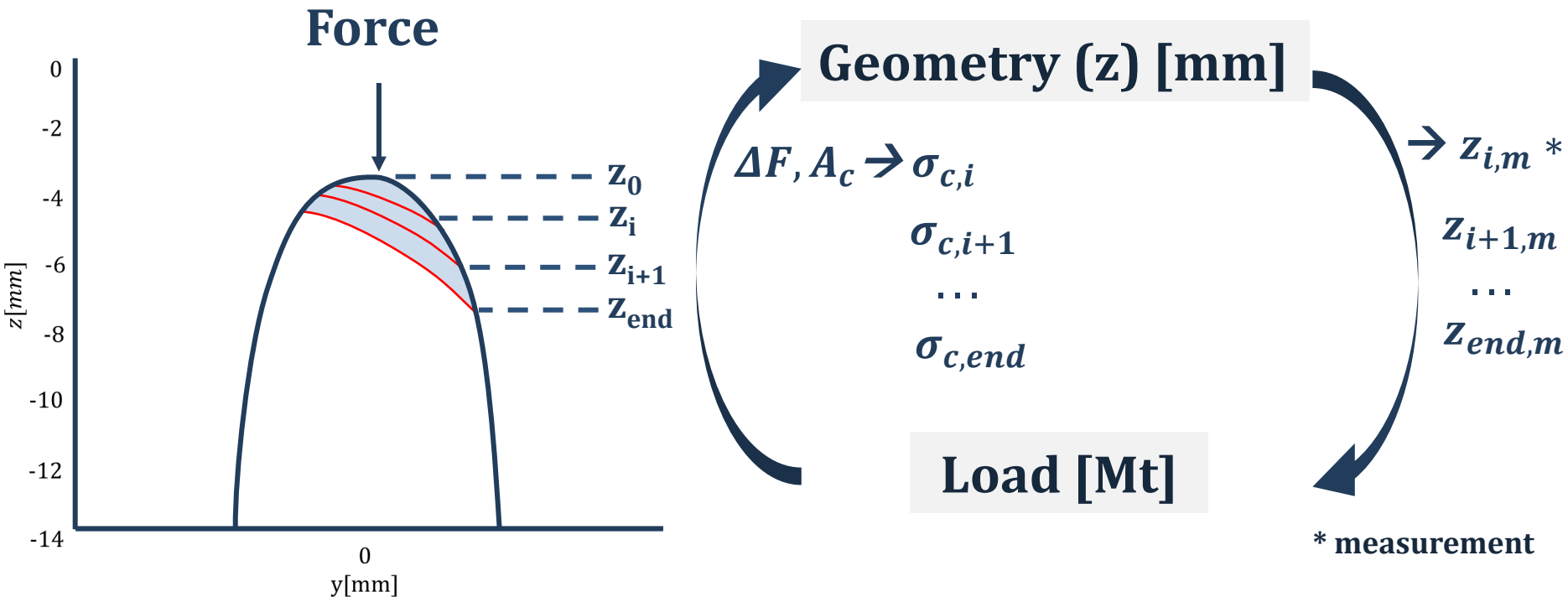

Figure 5: Relation between geometry and service life

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Determination of the switch frog geometry

- 1) Determination of the vertical area

  → $A_W\uparrow = f(F\uparrow, \Delta z\uparrow)$

- 2) Derivation of the contour from wear area

  → Contour(z) = $f(A_W, x)$

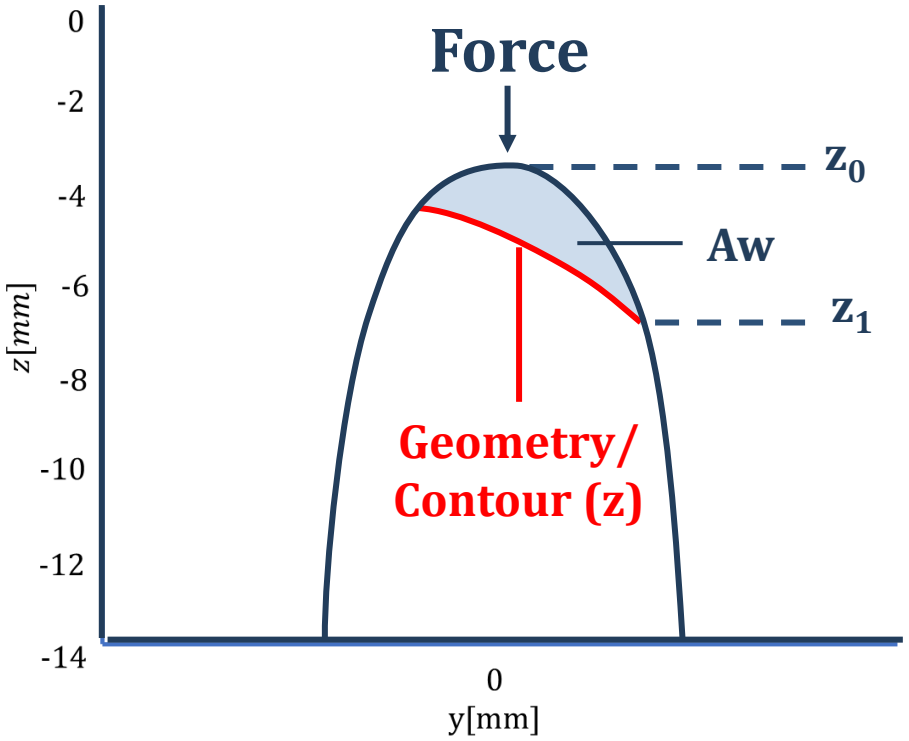


Figure 6: Contour (z)

Determination of the switch frog geometry

- **2) Contour(z) = f(A_W, x)**

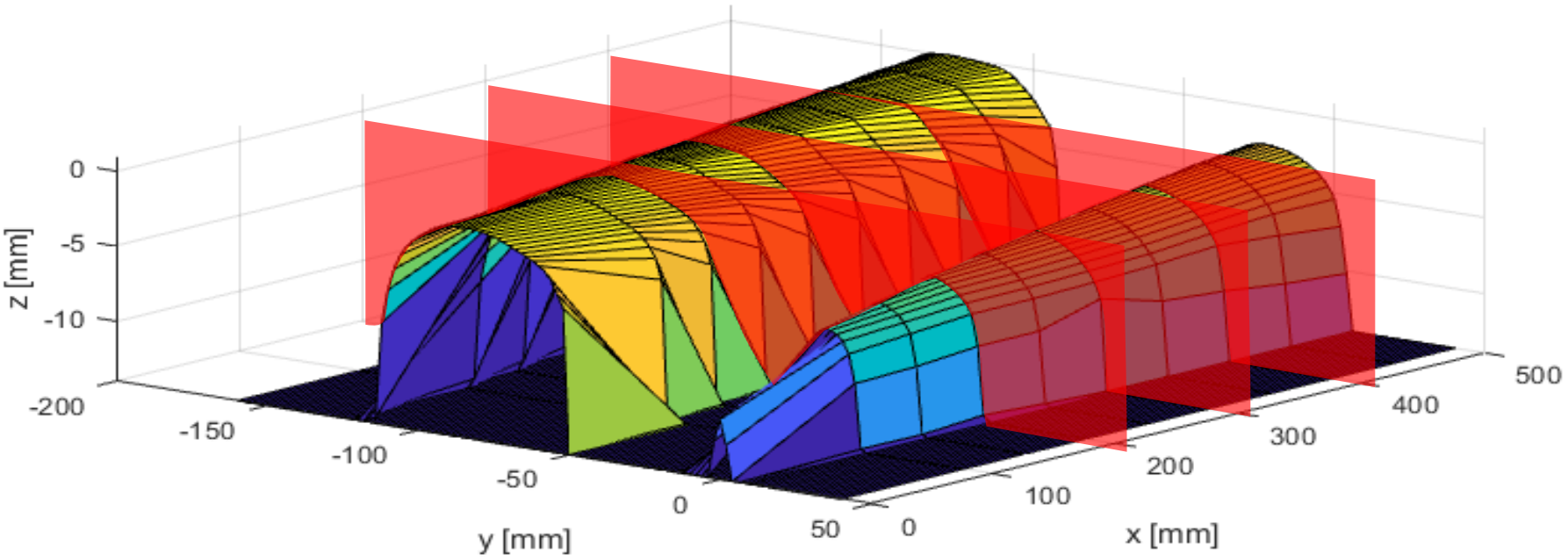


Figure 7: 3D-Modell [Kluge, F.]

Determination of the switch frog geometry

- 2) Contour(z) = f(A_w, x=200 mm)

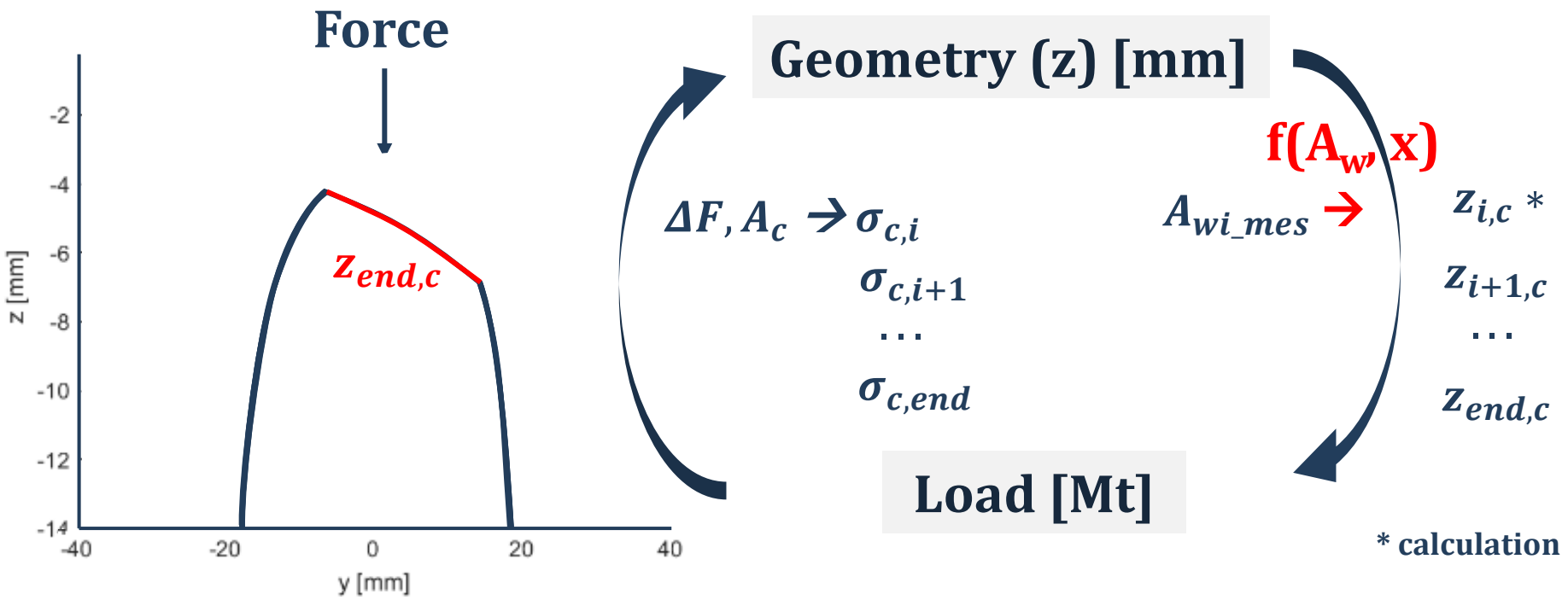
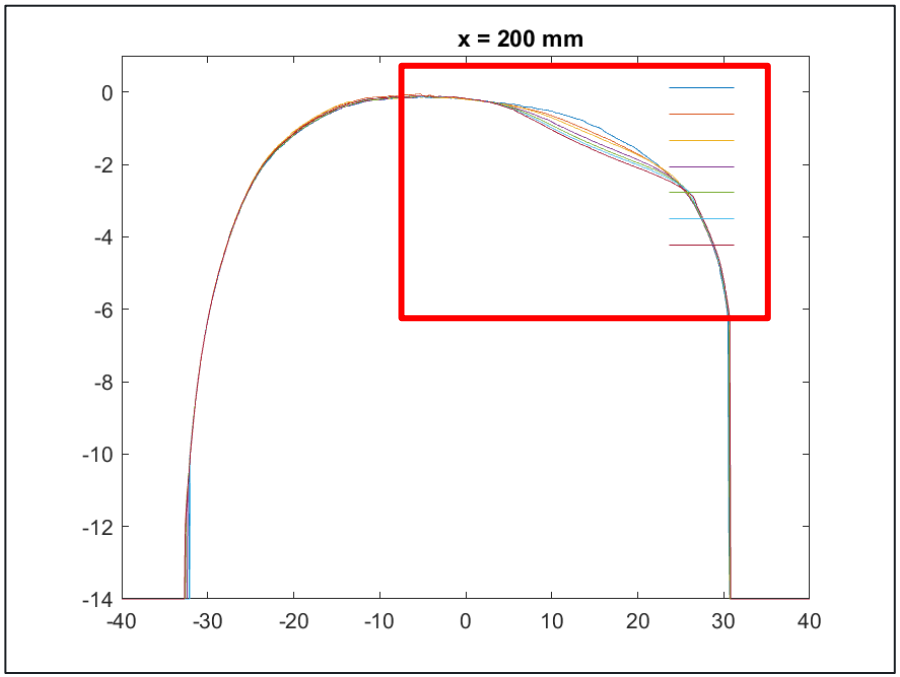


Figure 8: Determination of the frog geometry

Determination of the switch frog geometry

- **3) The comparison of the measured and calculated geometry**

Measured geometry



Calculated geometry

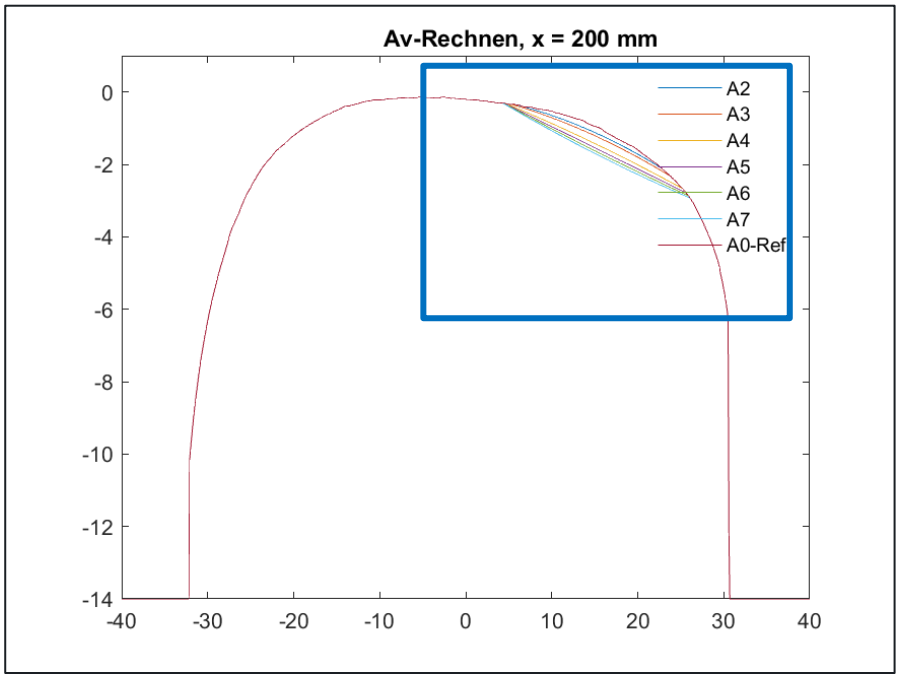


Figure 9: The comparison of the measured and calculated geometry

Determination of the switch frog geometry

- **3) The comparison of the measured and calculated geometry**

Measured geometry **Calculated geometry**

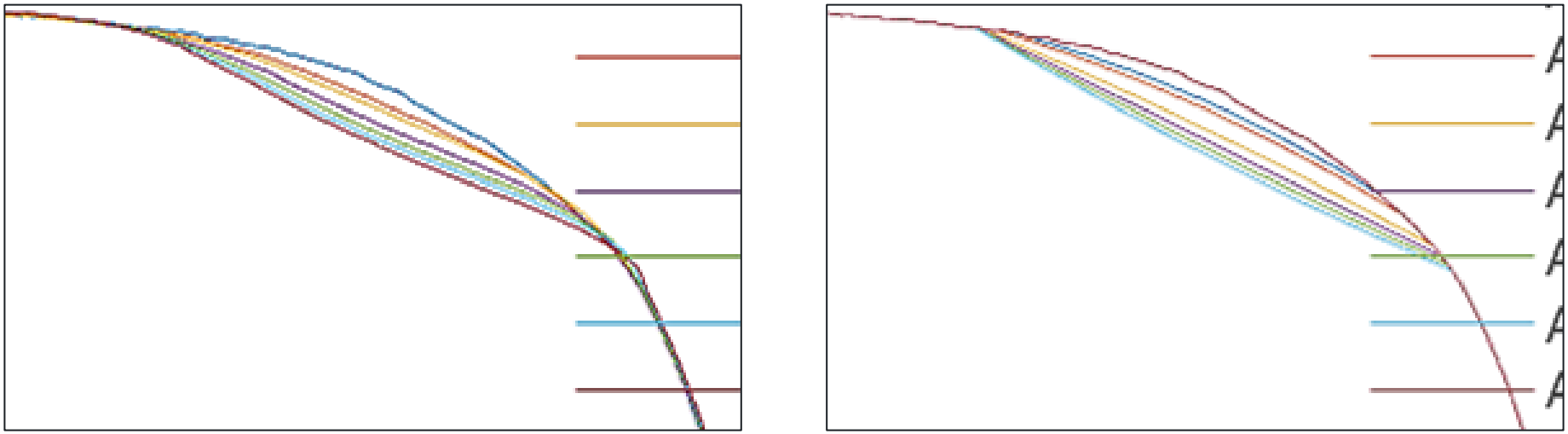


Figure 10: The comparison of the measured and calculated geometry 2

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Conclusions

- **Initial geometry of the switch frog**
  - **Individual progress → Geometry/ Wear Area**
  - **Service ↑ ~ $\frac{\text{Resilience (material)} \uparrow}{\text{Strain (geometry)} \downarrow}$**
- **Determination of the switch frog geometry**
  - **1) Vertical area → $A_W = f(F, \Delta z)$**
  - **2) Contour(z) = $f(A_W, x)$ → Geometry change**
  - **3) Improve the calculated geometry → the measured geometry.**

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References

- **[1] Gerber, U.; Fengler, W.: Belastung von Weichen mit starrer Herzstückspitze. ZEVRail - Glasers Annalen 131: Berlin; 2007, Mai: S.202-214.**