# InFaKeWe: Research into component optimisation for high-speed yarn guiding elements for processing highly abrasive yarns at high speeds based on ceramic materials and high-frequency vibrations.

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**Abstract**

The current state of the art for yarn feeders in circular and flat knitting machines is investigated, evaluated, mathematically modelled and presented in a simulation. Preliminary tests with existing yarn deflection systems will be analysed as analysis of the current state of the art. The resulting model forms the basis for the simulation of the yarn path of a circular and a flat knitting machine. The increase in yarn tensile force due to yarn friction on fixed machine components is modelled as a function of the parameters relevant to knitting production as follows:
- Yarn surface and structure
- Deflection angle
- Yarn friction coefficient
- Yarn speed
- Influence of high-frequency vibrations

Based on the simulation results innovative, passive, ceramic components are developed and the positioning in the yarn path is identified. The test series on the machine using the newly developed components are evaluated in order to optimise the simulation. The development of passive sintered ceramic components with active reduction of yarn friction using high-frequency vibrations and the simulation of the yarn feeding process are the development focuses followed with the development of a knitting machine based on these findings. The development of sintered IR-lucent, non-magnetic and electrically insulating ceramic components with adapted topography for use in knitting machines represents technological challenge and the planned project will develop:

- Passive ceramic deflectors with optimised surface texture and component geometry
- Friction reduction using high-frequency vibrations at the deflection points (avoidance of stick-slip effects and variation thread speed)
- Detection of yarn breaks or irregularities directly in the yarn path (translucent ceramic)
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