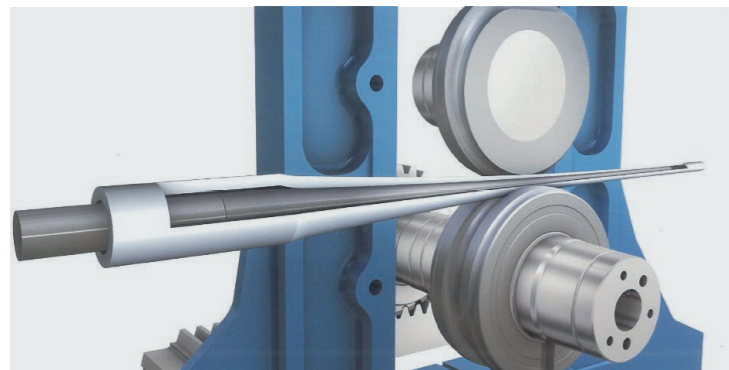


# Pilger Die·Mandrel Design, Manufacturing and Measurement

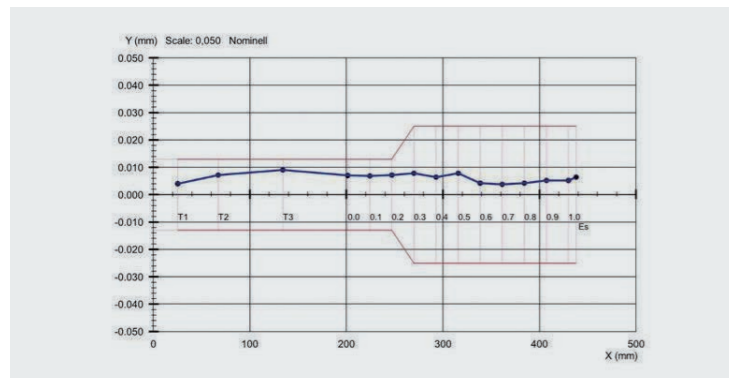
TUBE  
PRODUCTION  
DEPT.

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The Pilger Tools(Die and Mandrel) are key components in manufacturing the fuel tubes, these determine the material structure and tube quality. KNF has developed an independent technology that designs, manufactures and measures pilger tools for the purpose of stable supply which used to be entirely imported from overseas.



< Pilger Die-Mandrel >



< Pilger Tool Measurement >

## Description

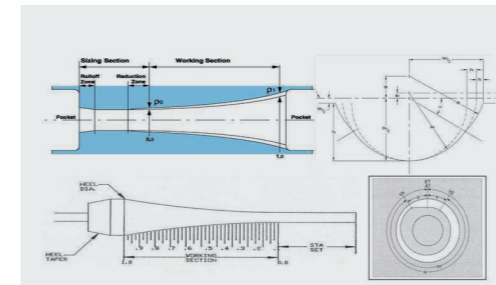
### \* Purpose and Necessity

- To obtain proper tube OD/ID quality that satisfies the final tube inspection criteria and to control the tube size in every step of pilgering process.
- To manufacture high quality pilger tools that satisfy the required mechanical properties that a fuel tube should have, and to control tube texture.

### \* Principle

- Design and manufacturing of pilger die
  - Designing the characteristic pilger die groove using the pilger tool design program
  - Setting CNC programs to grind characteristic pilger die groove.
  - Precise processing of pilger die groove with size measurement and grinding volume compensation for each axis during operation.
- Design and manufacturing of pilger mandrel
  - Designing the characteristic pilger mandrel profile using the pilger tool design program
  - Setting CNC programs to grind characteristic pilger mandrel profile.
  - Precise processing of pilger mandrel profile with size measurement and grinding volume compensation for each axis during operation.

- 3D CMM measurement of pilger die
  - Measuring deviation between real value and idle curve value of pilger die groove.
  - Verifying grinding quality by measuring size of pilger die groove sections.
- Laser measurement of pilger mandrel
  - Measuring deviation between real value and idle curve value of pilger mandrel profile.
  - Verifying grinding quality by measuring size of pilger mandrel sections.

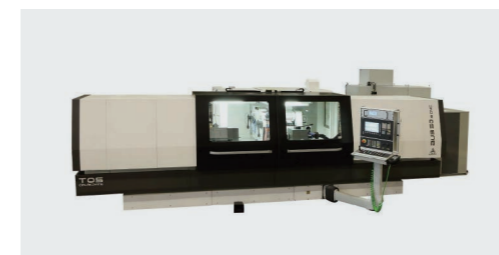


< Pilger Die Groove and Mandrel Profile >

### \* Composition of Equipment



< Pilger Die CNC Grinder >



< Pilger Mandrel CNC Grinder >



< Pilger Die 3D CMM  
Measuring Machine >

< Pilger Mandrel Laser Measuring  
Machine >

## Distinctiveness

### \* Characteristics

- Through years of use, the pilger tools that manufactured by Korean technology from design to final measurement have proved that it has better quality than imported pilger tools.

### \* Benefits

- Tubes of new dimensions along with development of new FA(Fuel Assembly) can be manufactured
- Pilger tools quality can be improved to have better tube quality
- Contributing to stable tube supply with localized pilger tool manufacturing technology
- Save cost on importing pilger tools

## Experience

- Pilger tools that manufactured by localized technology have been supplied to TSA and NSA.

## Deliverables

- Pilger die and mandrel design/manufacturing
- Pilger die and mandrel measurement

## TECHNOLOGY READINESS LEVEL(TRL)

- Actual system proven through operation

## BUSINESS MODEL

Technology Transfer

Licensing

Joint search

Service Execution

Others