

SPECIAL REQUIREMENTS IN EXTRUSION TECHNOLOGY FOR FRNC - CABLES

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SPECIAL REQUIREMENTS IN EXTRUSION TECHNOLOGY FOR FRNC - CABLES

- Materials
- What is the problem of extrusion?
- How to solve the extrusion problem?
- Conclusions

Definitions

- **FRNC** : **F**lame **R**etardent **N**on **C**orrosive
- **LSZH** : **L**ow **S**moke **Z**ero **H**alogen
- **HFFR** : **H**alogen **F**ree **F**ire **R**esistant

Polymer Materials

- Polymer base is mostly polyolefin (PE, PP) or TPE
- Polymer is highly filled with FR-agents (50-70%)

Flame retardent agents

- **Aluminiumhydroxid (ATH) : $\text{Al}(\text{OH})_3$**



Processing temperature < 200 °C

Density : 2,4 kg/l

- **Magnesiumhydroxid (MDH) : $\text{Mg}(\text{OH})_2$**



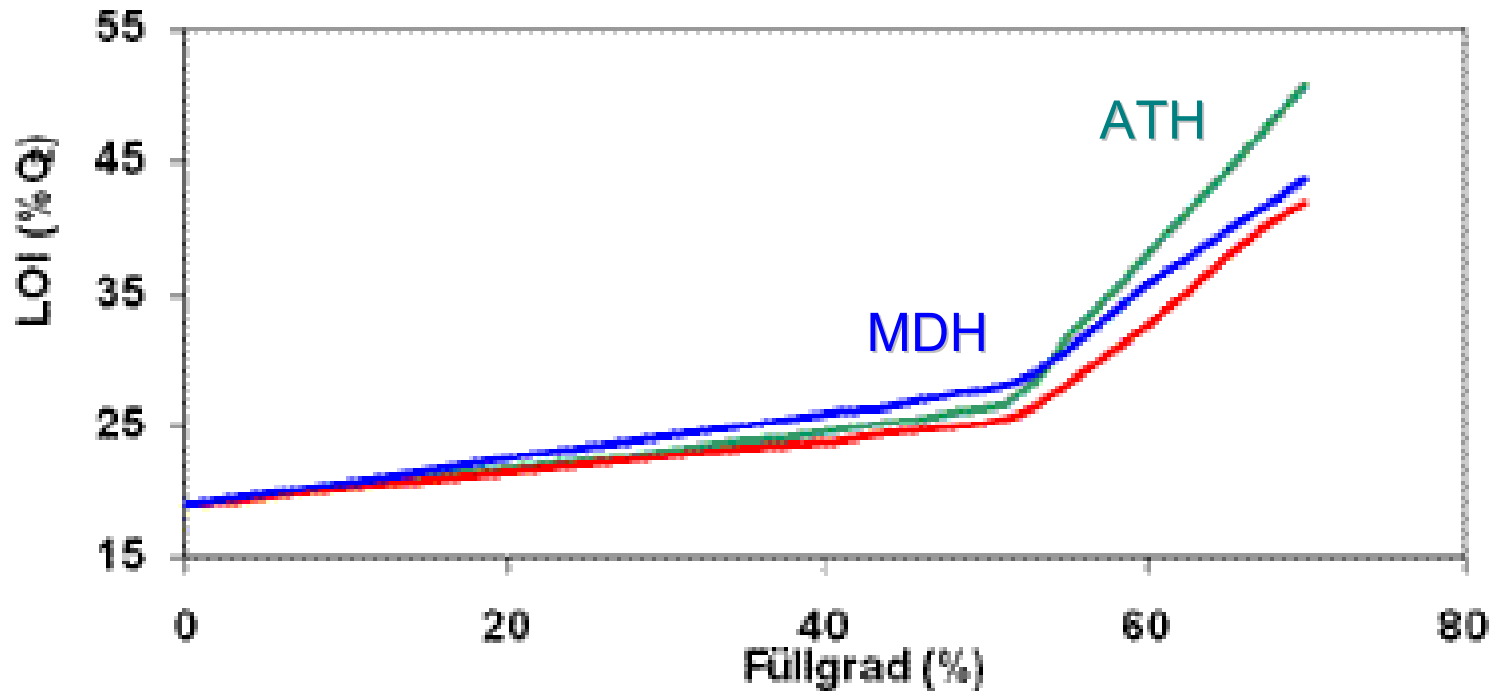
Processing temperature < 300 °C

Density : 2,4 kg/l

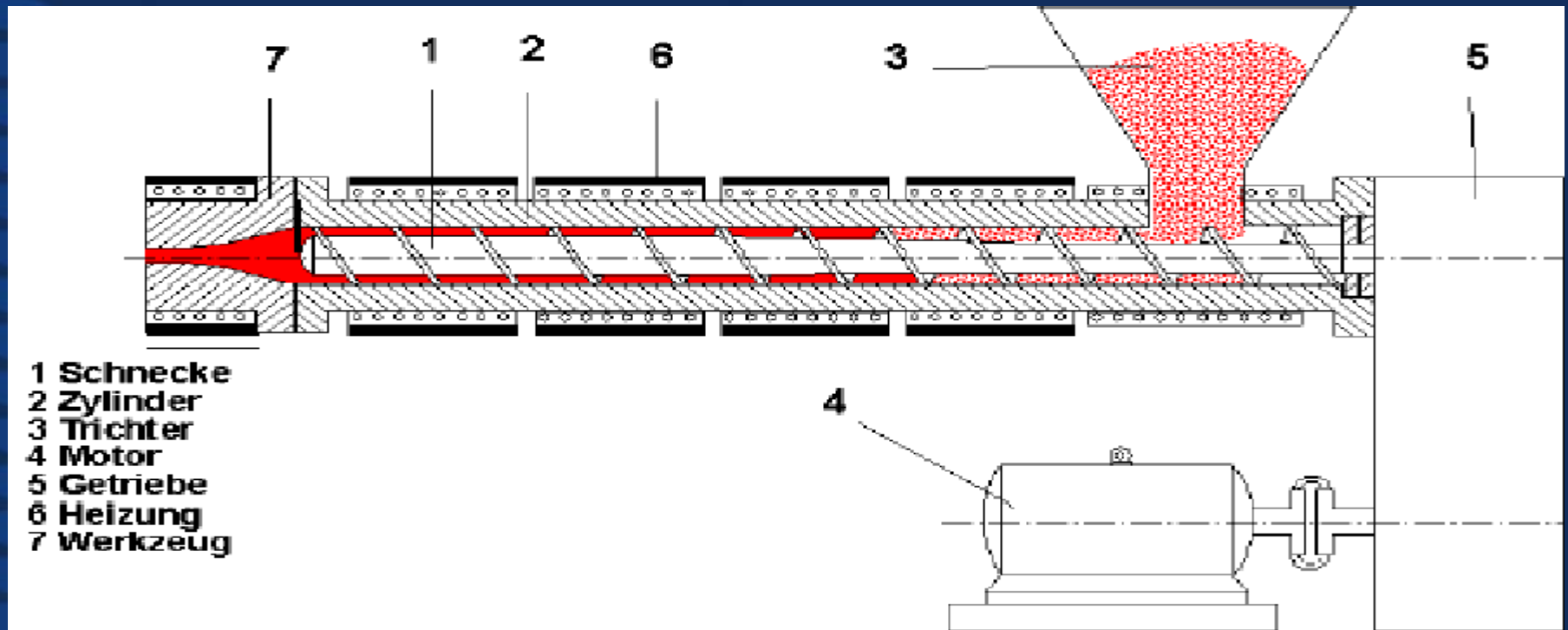
Flame retardent agents

- Oxygen Index (LOI)

LOI -Werte für ein EVA-Compound
mit unterschiedlichen Füllgraden



Extruder objectivs



- Output
- Melting
- Homogenization

Problems of extrusion of FRNC polymers

- high torque moment due to the filled polymer structure
- high friction -> raising melt temperature -> chemical reaction
- low screw rpm -> low output
- homogenization problems (lumps, surface problems)
- thermomechanical failure of cable



Perfect screw design necessary

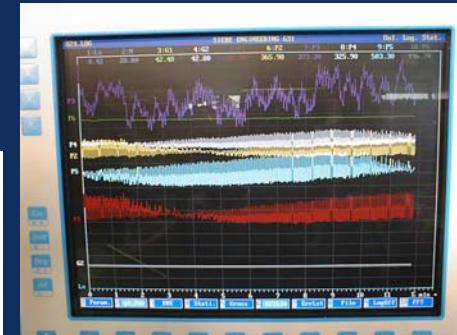
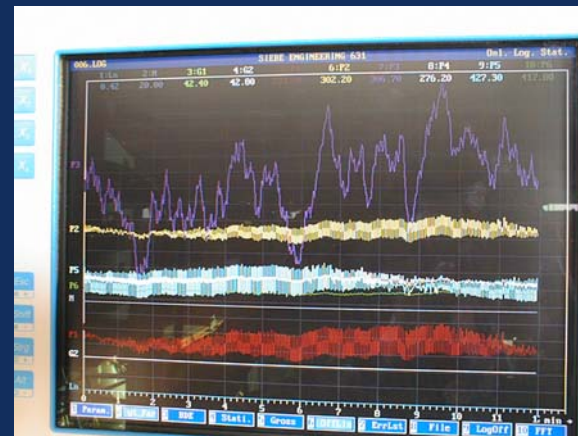
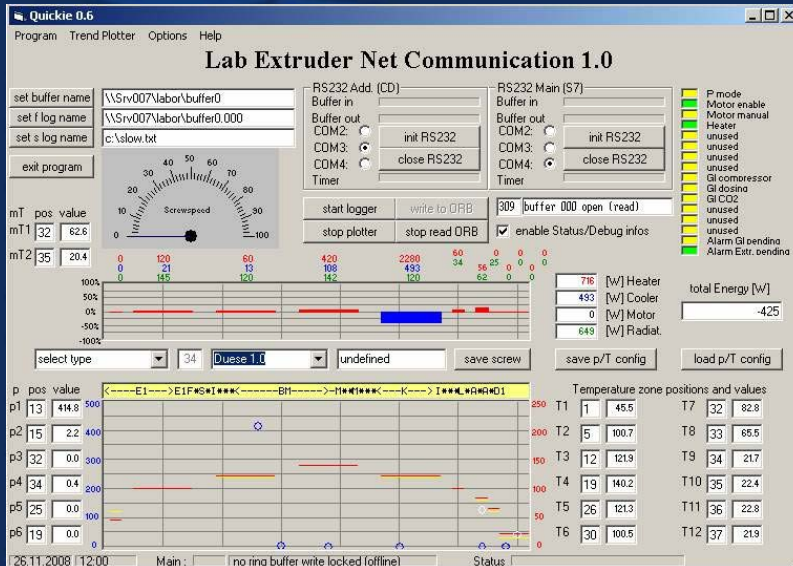
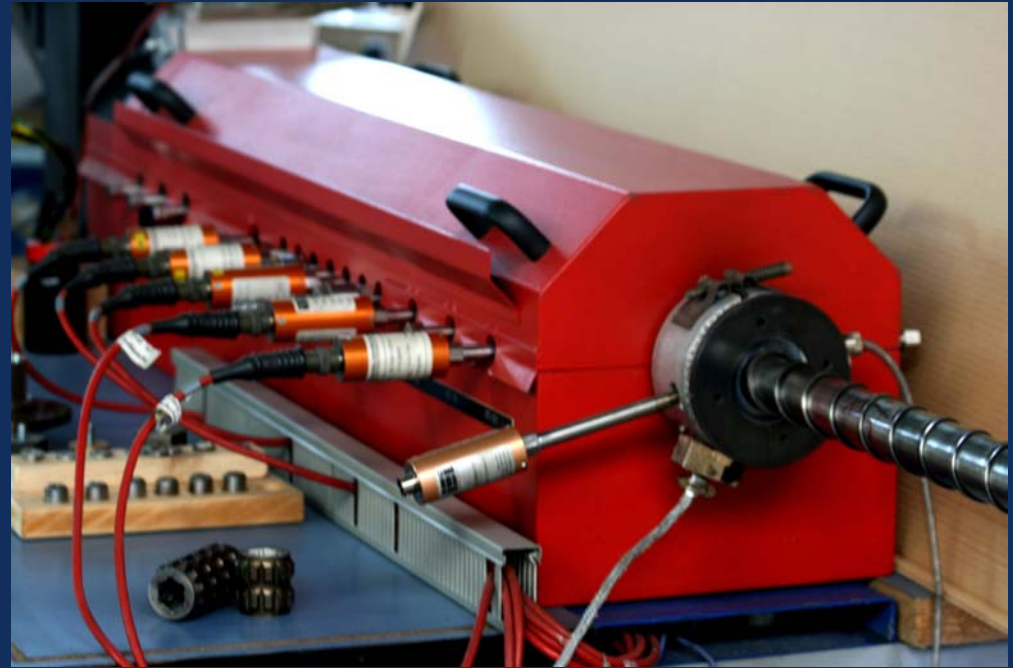
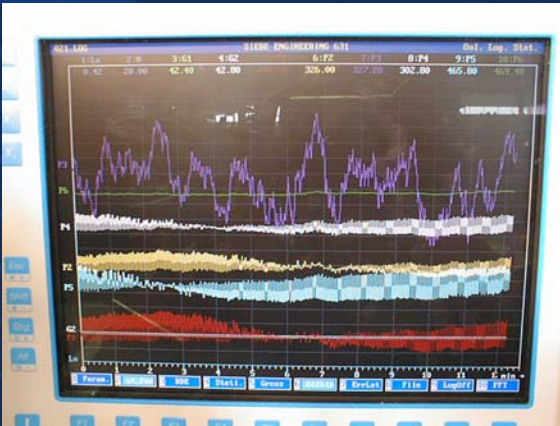
How to get the perfect screw design

- SIEBE has FRNC experience since 1986 (Megolon)
- Try and error -> lot of time and money -> no way
- scientific understanding of rheology and thermodynamics
- calculation and simulation of screw design -> impossible
- impossible -> dynamic process, material data not available
- experience and science -> laboratory test



Laboratory extruder for process analysis

SIEBE Labextruder



Lab screw segments



In

How to optimize screw design

- Energy consumption over screw profile
- Specific heat
- Pressure profile
- Mixing quality
- Output optimization
- Melting process analyse


Conclusions

- Computerized evaluation of measurement data
- Causality principle of material and screw geometry
- Scale – Up from lab-size to production-size
- today SIEBE has for all FRNC materials standard screw designs for optimum output and homogenization
- we are always testing new materials and compounds for customers and material suppliers
- we are involved in scientific research programs

Applications

- NEXANS Material Design Center
- LEONI Research and Development
- Huber&Suhner Material development
- LS Cable Material Development
- Dyneon Central Laboratory
- nearly all of our customers have FRNC screws (Automotive, telecommunication, energy cables)

Many thanks for your attention!



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