

THE ROLE OF ACTIVE FIRE PROTECTION MEASURES IN A NATIONAL FIRE SAFETY CONCEPT IN GERMANY

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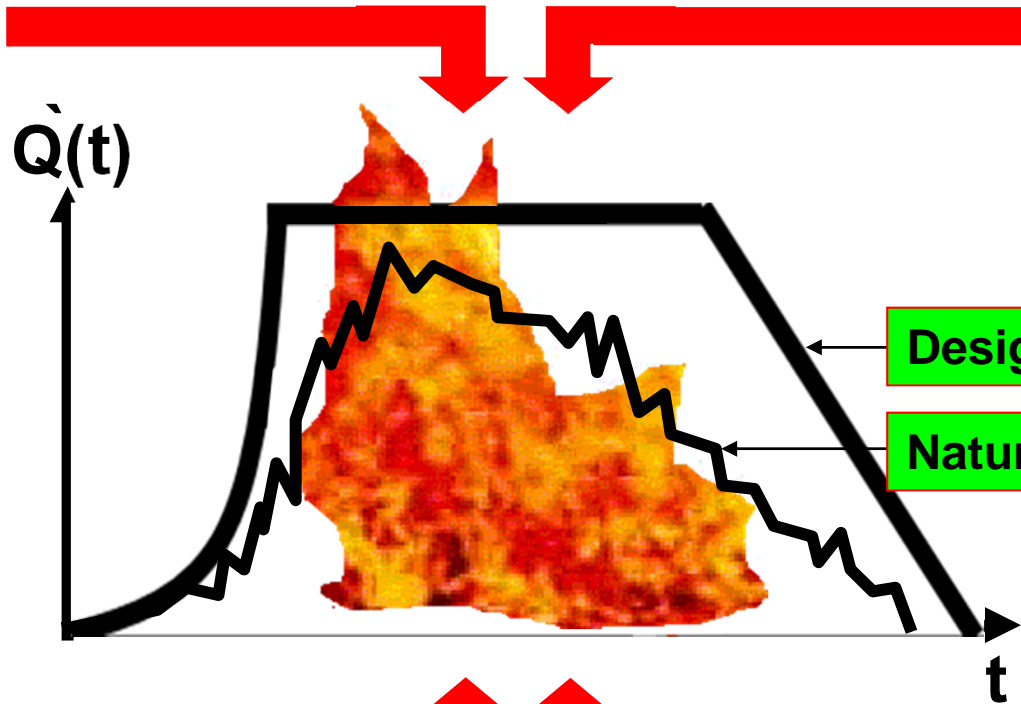
➤ Introduction

- Active fire protection measures play an important role in performance-based fire safety concepts
- But active fire protection measures can fail in certain cases, e.g. for technical reasons
- How can they be considered in fire safety concepts without an overestimation of the overall safety level?
 - ➔ new national semi-probabilistic safety concept published in DIN EN 1991-1-2/NA (EC 1-1-2/NA)



Fire alarm systems

Sprinkler systems



Design fire

Natural fire



Smoke and heat exhausts

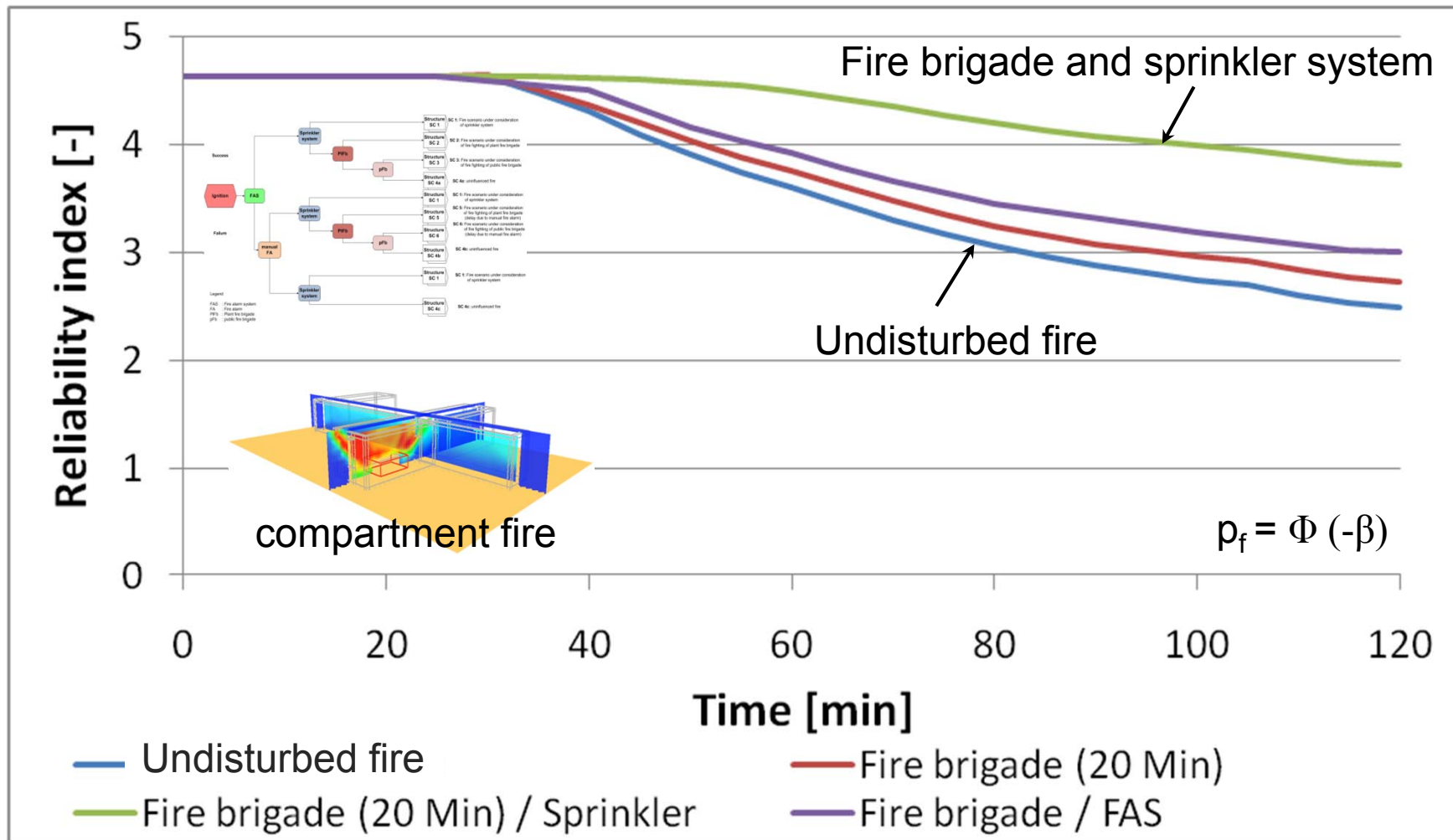
Fire brigade



➤ The impact on the overall safety level

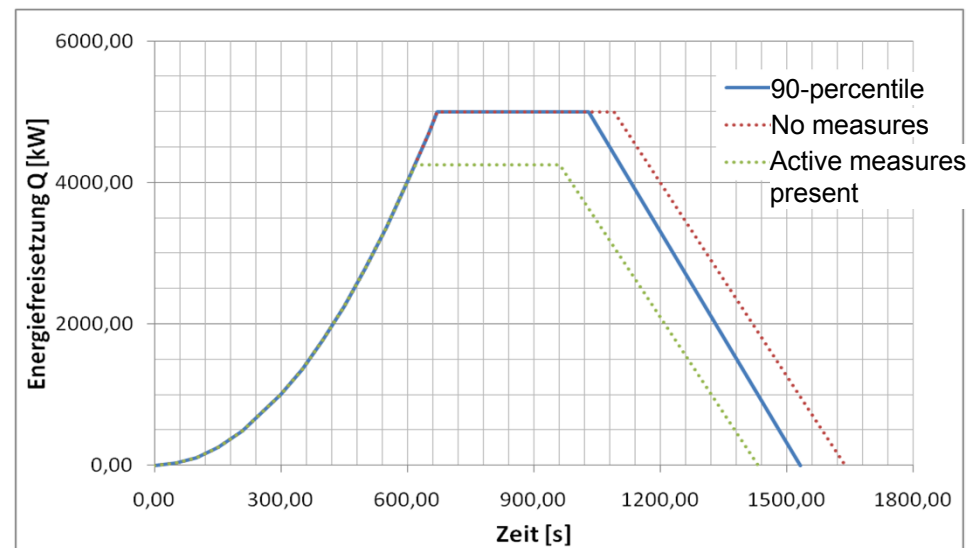
- The assumption that active fire protection measures are always present and working can lead to an overestimated safety level → development of a safety concept necessary
- The developed safety concept is based on probabilistic analyses
 - the effects of the measures on natural fires are modeled
 - the relation between the measures is identified & modeled (fault-tree)
 - the safety level of the whole system [Reliability index β , probability of failure p_f] is quantified via the First-Order-Reliability method (FORM)

➤ Probabilistic analyses (FORM)



➤ Design fires and active prot. measures

- Findings were incorporated into the safety concept for the fire design of structural members (ultimate limit state)
 - published in the German National Annex of EC 1-1-2
 - the design fire bases on the HRR of an undisturbed fire
 - 90-percentile of fire load and heat release rate
 - partial safety factors guaranty an accurate safety level by modifying fire load and heat release
 - the factors were calibrated according to the safety benefit of the different active fire protection measures



➤ Conclusions & Outlook

- The background of the consideration of active fire protection measures in the new safety concept in EC 1-1-2/NA / DIN EN 1991-1-2/NA was introduced
- Limitations of the safety concept
 - the area of the design fire is not limited to a maximum size, the active fire protection measures are not considered here
 - ➔ in theory the whole room can on fire, especially in large rooms this is not realistic
- Further research is required to derive reasonable maximum fire sizes for common buildings



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