



Software driven real time tracking of DSG fouling

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Presentation outline

- Introduction
- DSG operation - Challenges
- DSG control philosophy
- Incident at client's site
- Software driven real time tracking of DSG fouling
- Insights
- Q and A



Introduction

Dilution Steam Generation in Ethylene Plants

- Ethylene pyrolysis furnaces need dilution steam (DS)
- Most plants handle/generate DS as a separate system from utility steam system
- Dilution Steam Generator (DSG) produces DS with pretreated process water (PW) from Quench Tower
- DSG operation faces challenges related to corrosion & fouling



DSG operation challenges

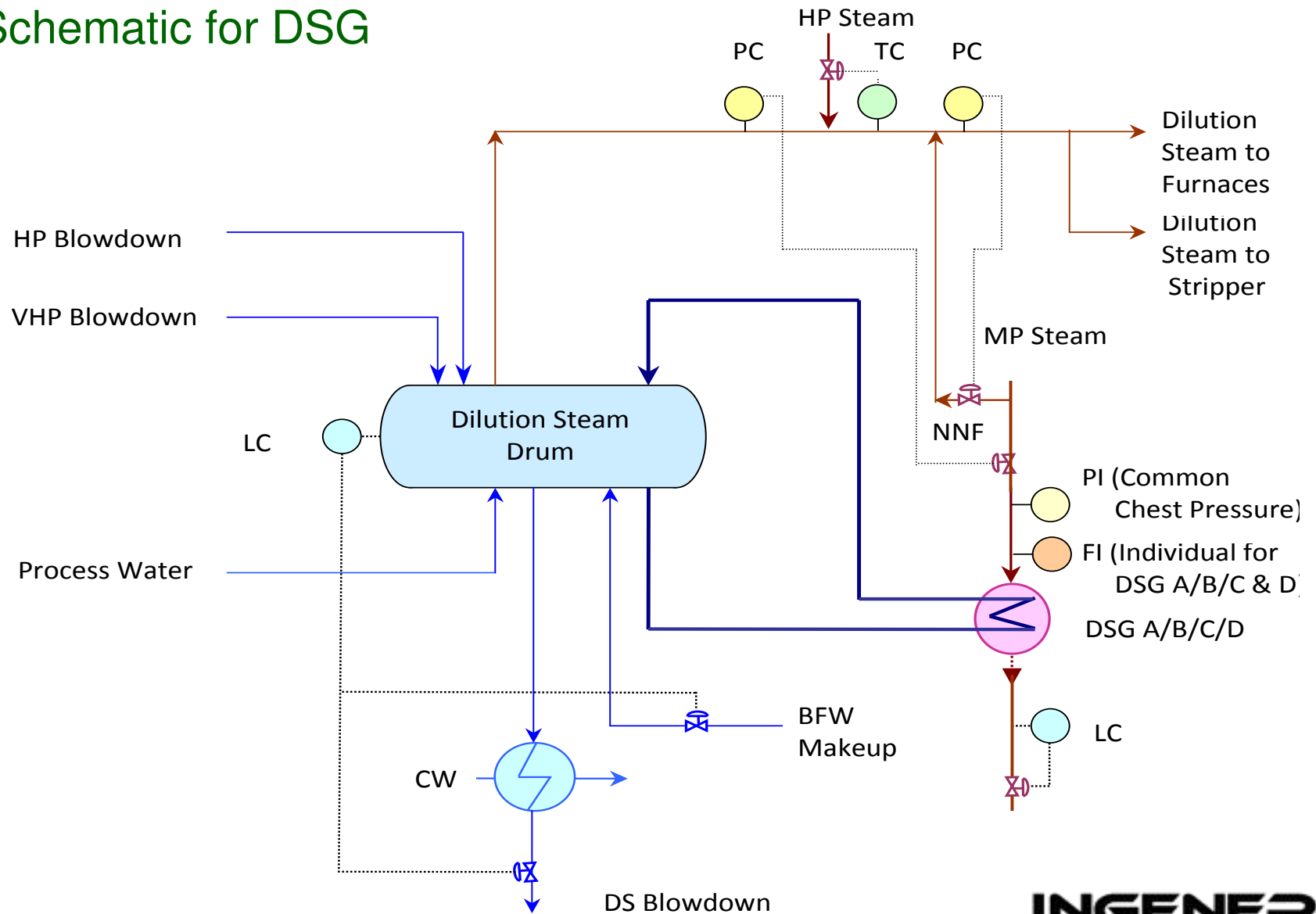
Corrosion & fouling in DSG heat exchanger (HEX)

- Corrosion caused by:
 - Acidic compounds
 - Controlled by maintaining pH
 - Dissolved oxygen
 - Controlled by injecting O₂ Scavenger
- Fouling caused by:
 - Hydrocarbons like phenolic compounds
 - Controlled by chemical dosing; emulsion breaker
- Typically, HEX designed with a spare for cleaning and repair
- Tracking DSG fouling is key to reliability and asset availability



DSG control philosophy

Schematic for DSG





Incident at client's site

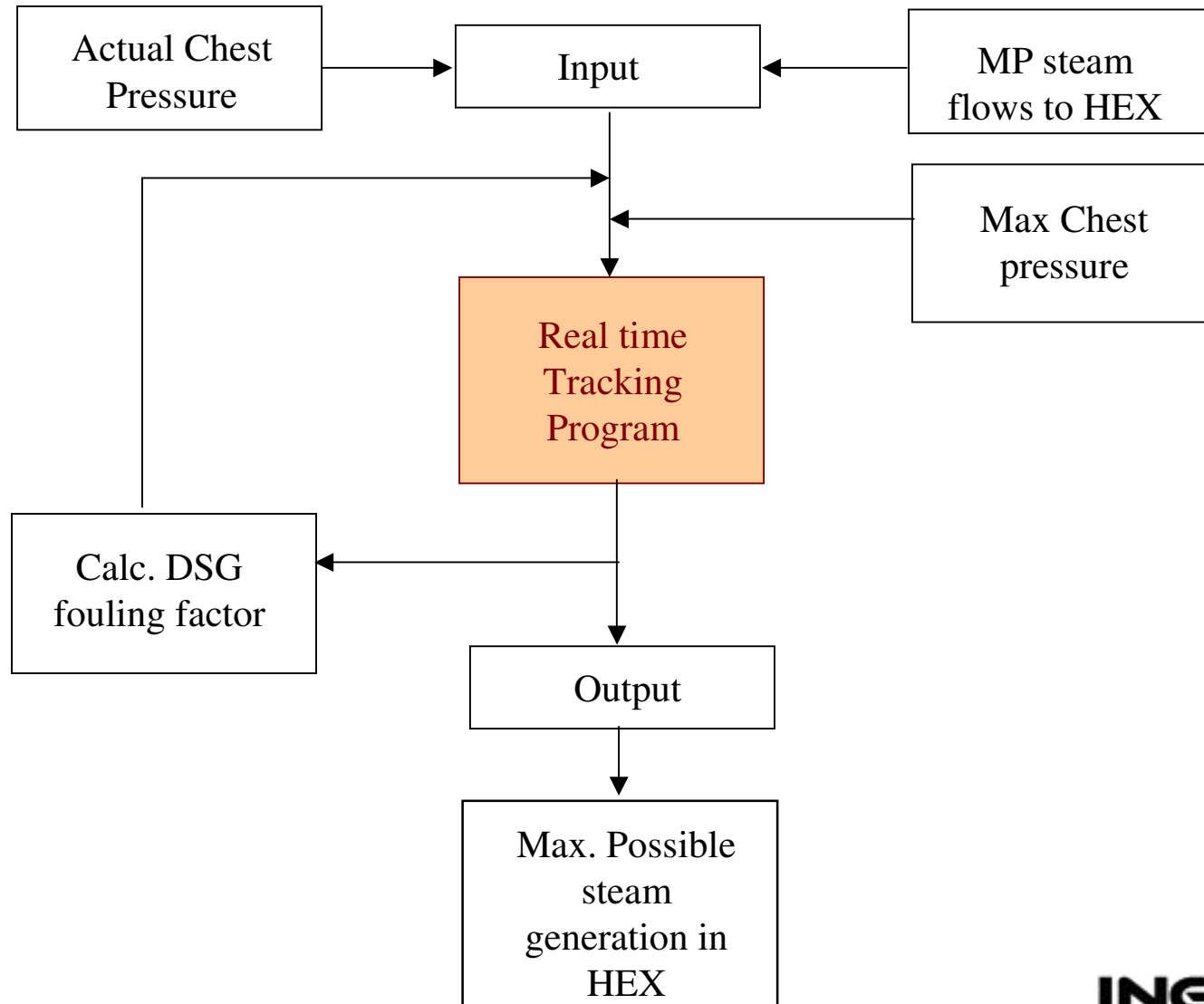
Necessitate real time tracking program for DSG fouling

- Due to sudden drop in feed header pressure,
 - 3 out of 8 furnaces were taken in Hot Steam Stand-by (HSSB) mode
 - 5 furnaces tripped to HSSB condition
- Triggered sudden increase in DS demand
- Insufficient MP steam letdown to DS header and fouled DSG's failed to meet the DS requirement
- Five furnaces total shut down
 - Lead to coils damage & one month's production loss
- In order to avoid such incidences in the future,
 - A real time tracking program developed to estimate the maximum DS generation capacity at actual fouling conditions.



Software for real time tracking of DSG fouling (1)

Flow Chart





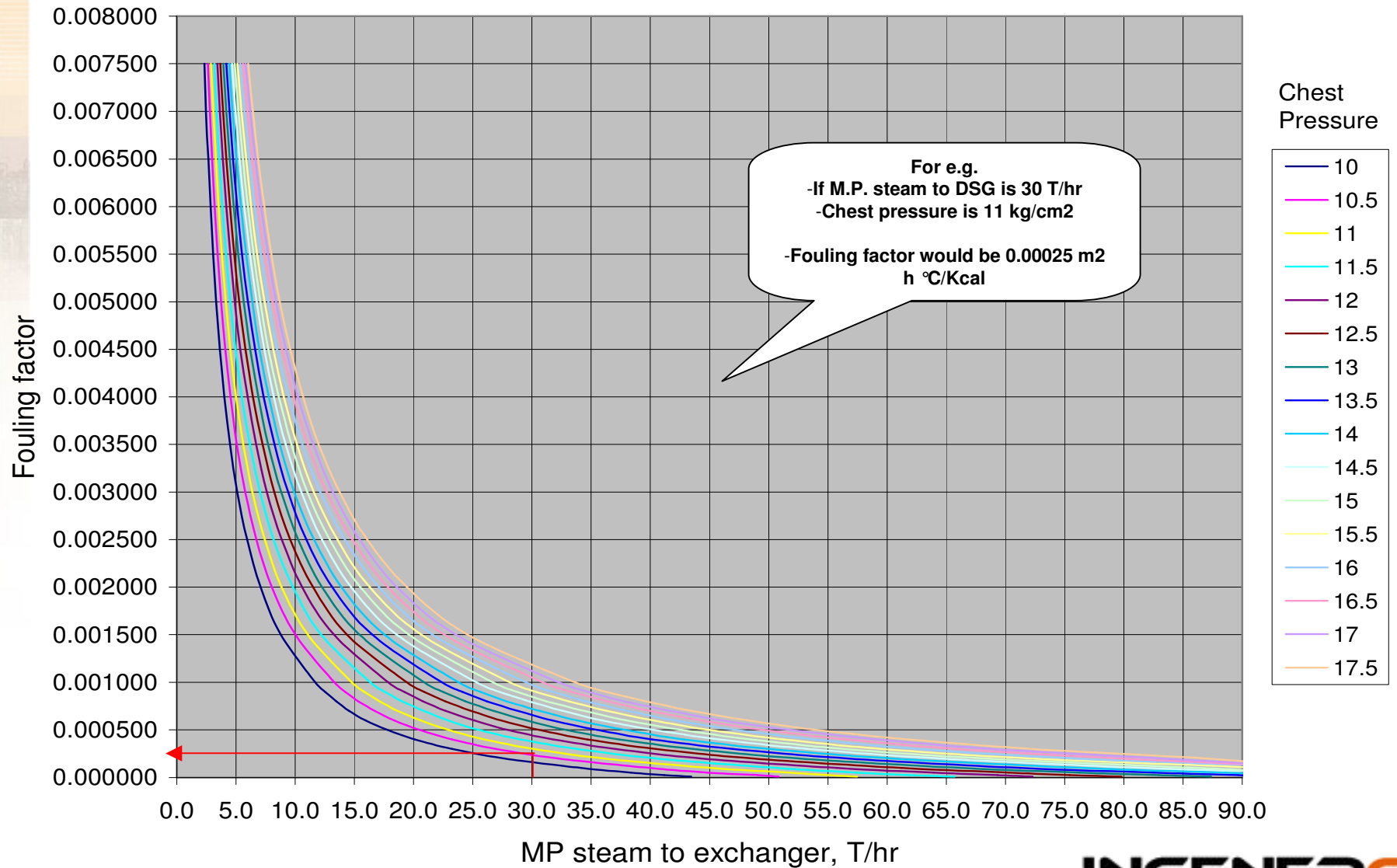
Software for real time tracking of DSG fouling (2)

How it works

- Standard heat exchanger design software used for;
 - Fouling Matrix
 - Fouling data populated for various operating scenarios
 - Variables:
 - Steam flow to reboiler (HEX)
 - Steam chest pressure
 - Maximum steam generation Matrix
 - Populating data of maximum possible DS at higher chest pressure and fouling
- Using these 2 matrices;
 - Extrapolate fouling numbers for the present case
 - Estimate maximum possible DS generation
 - Check if MAX DS is insufficient for worst operating case

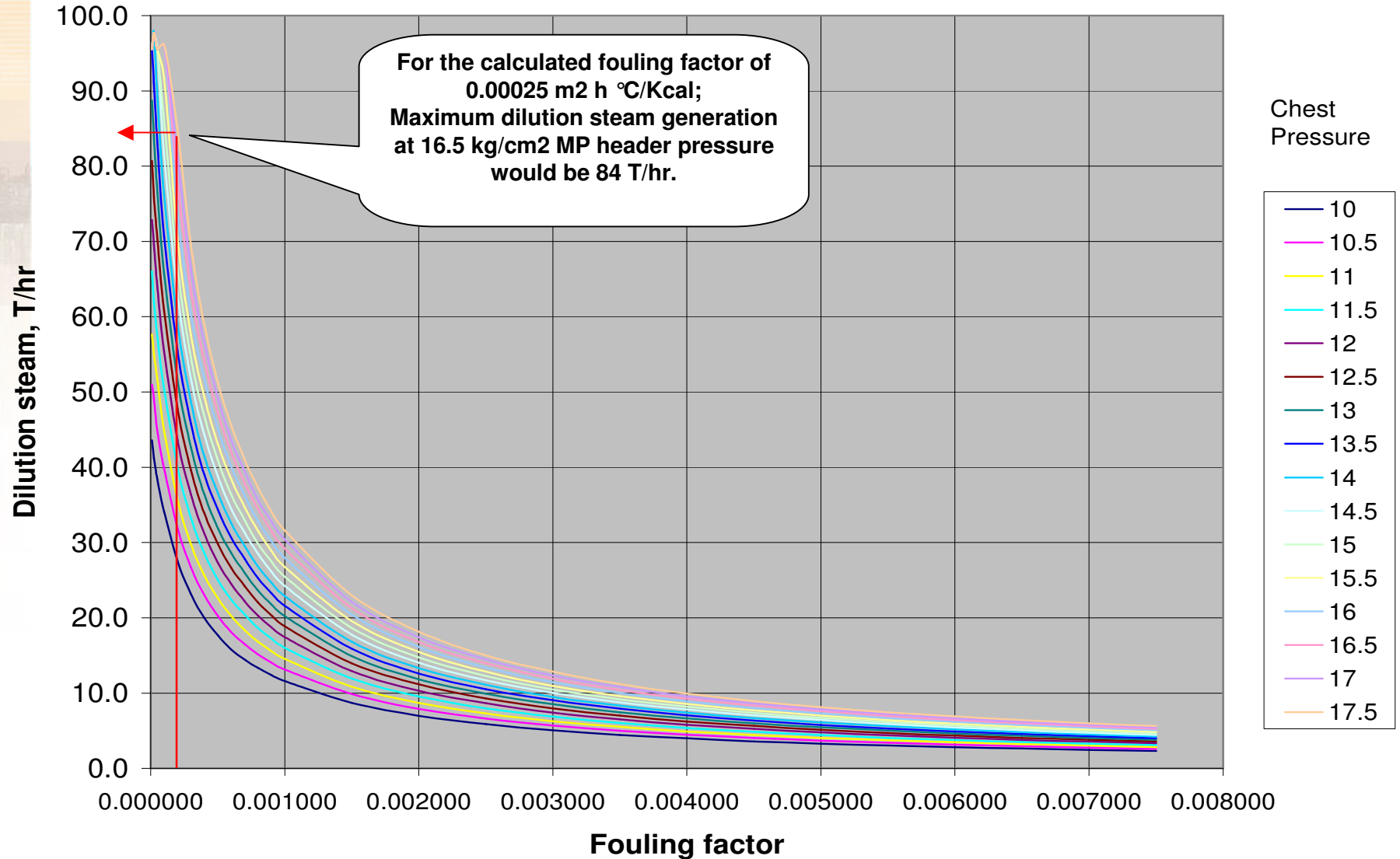


Fouling Matrix





Maximum steam generation Matrix





Benefits of real time tracking of DSG fouling

- Real time monitoring of Max. DS generation capacity
 - Helps to ensure adequate DS to cater worst case scenario
- Effective scheduling of DSG changeover and cleaning
- No need of standard heat exchanger design software



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