

IWMA 2012 - Barcelona

# Quantifying the effectiveness of water mist systems using oxygen and humidity measurements

Are W. Brandt & Christian Sesseng

# Traditional methods for quantifying the effect of the system

- Visual observations
  - Size of the fire (if even possible)
  - Smoke, see how the fire breathes
- Temperature measurements using thermocouples
  - In spray
  - In pool
  - In room
- IR camera
- O<sub>2</sub> concentration

## Use of IR camera to verify extinguishment



## Visual observations of smoke



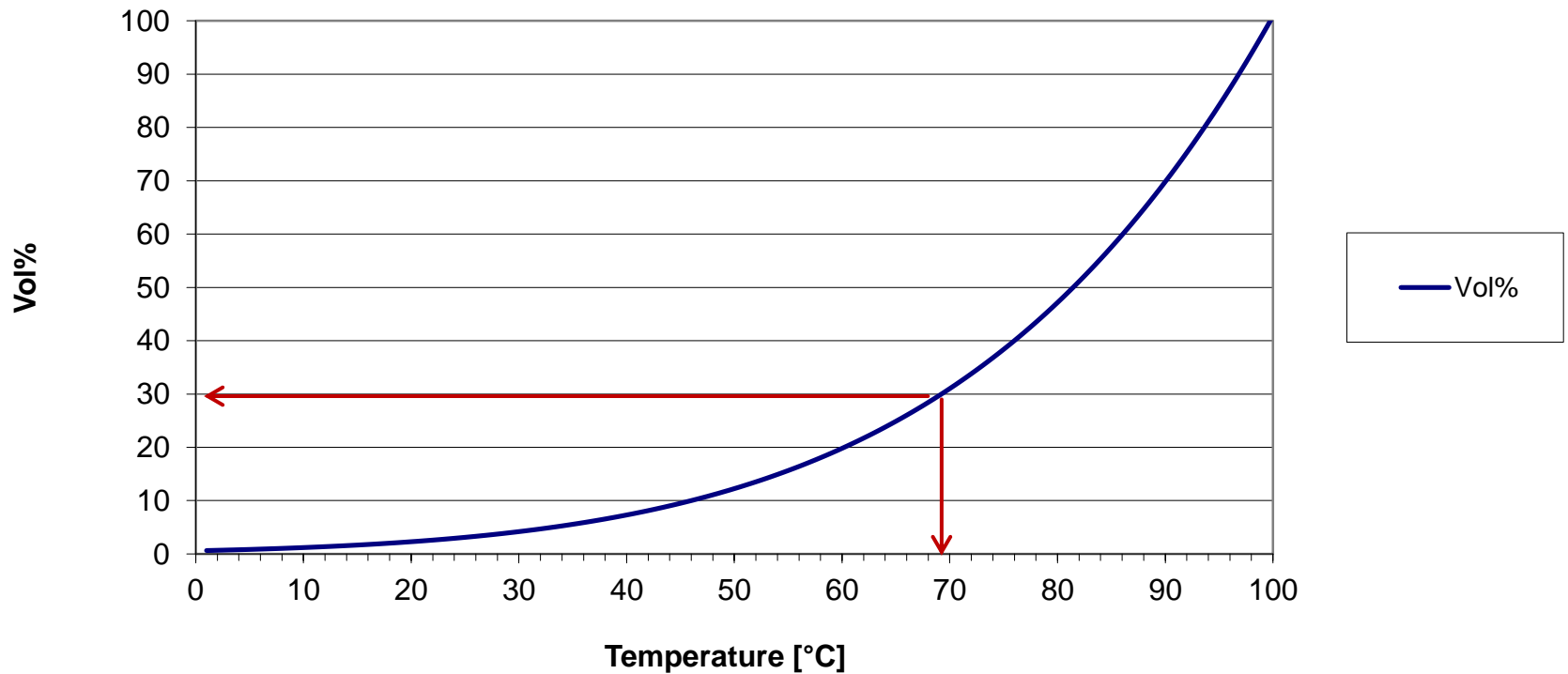
Example of how to use humidity and oxygen measurements to determine the effectiveness of a water mist system.



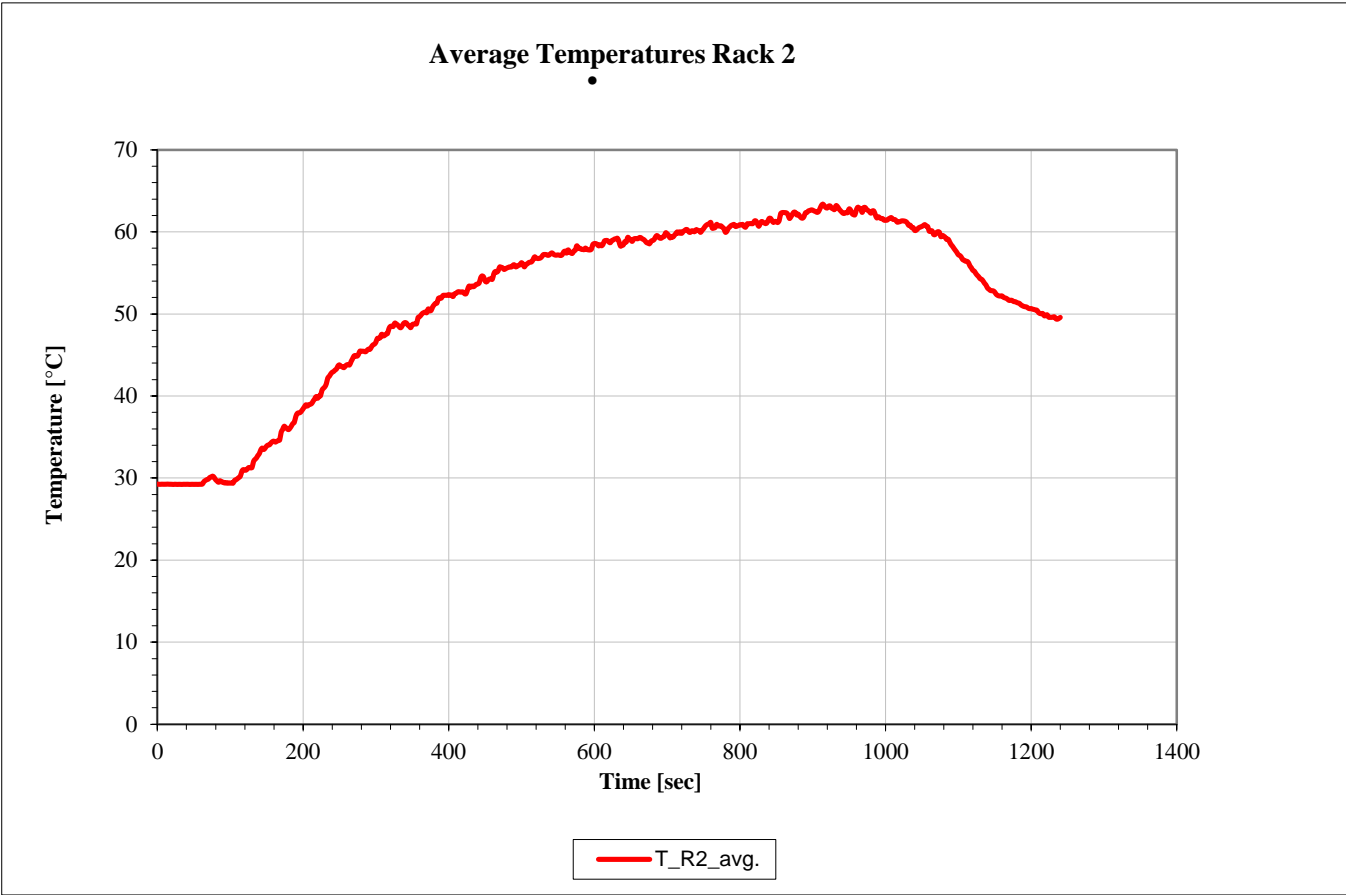
# Premises

- Tests conducted inside our large test hall
- Conducted test according to IMO 1165 (668/728) in a machinery space measuring 19,5x17,0x10,1 (LxWxH) giving a total volume of 3348 m<sup>3</sup>.
- To create ~30% inert gas (Water vapor) we need ~800 liter of water (at 70°C)

## Maximum volume percentage of humidity vs. temperature



# Assumed average temperature in test compartment





# Calculating corrected oxygen concentration

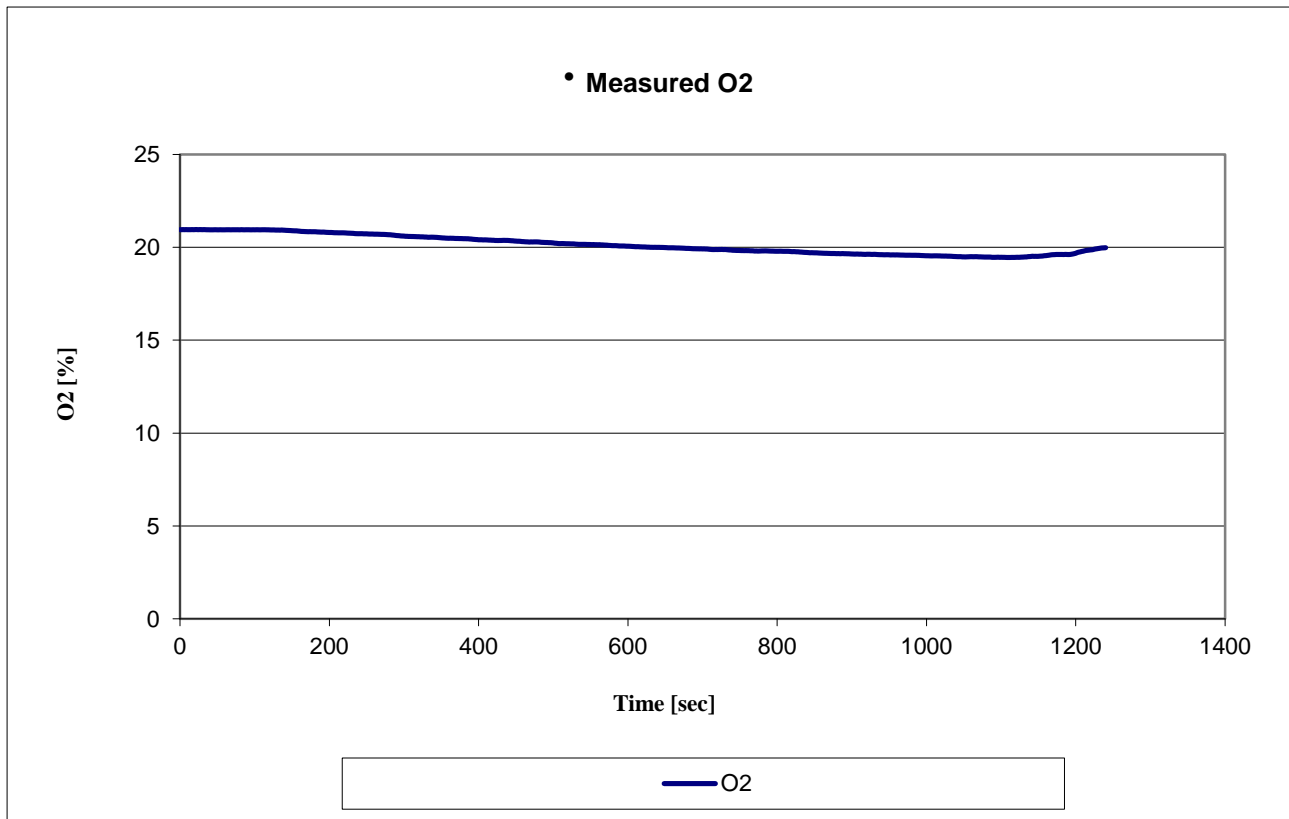
$$Vol\%_{H_2O} = RH\%_{Mess} * \frac{PWS}{Atm\ Press}$$

$$PWS = K_1 * 10^{\left( K_2 * \left( \frac{T_{Mess}}{T_{Mess} + K_3} \right) \right)}$$

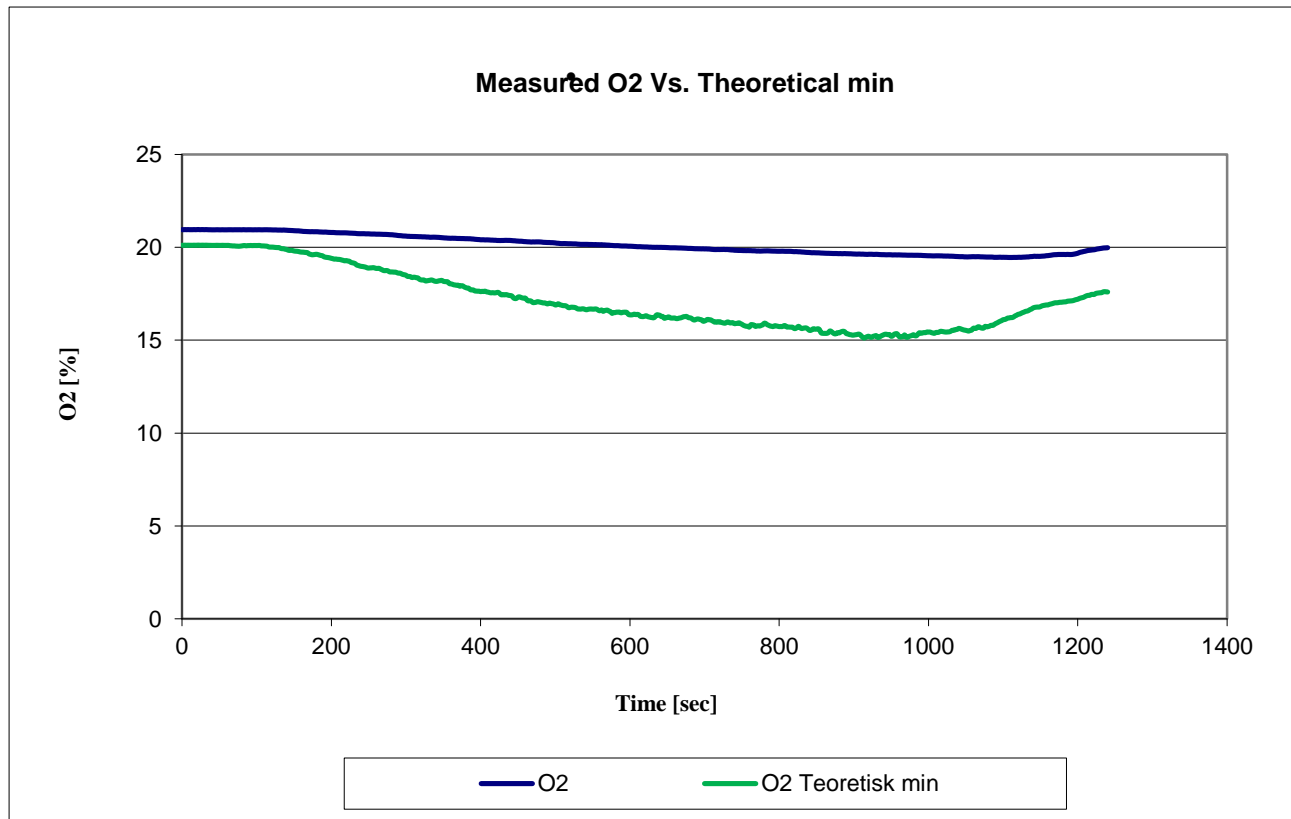
$$O_{2Corr} = O_{2Mess} * \frac{100 - Vol\%_{H_2O}}{100}$$

$$\begin{aligned} K_1 &= 5,8493 \\ K_2 &= 7,2756 \\ K_3 &= 225 \end{aligned}$$

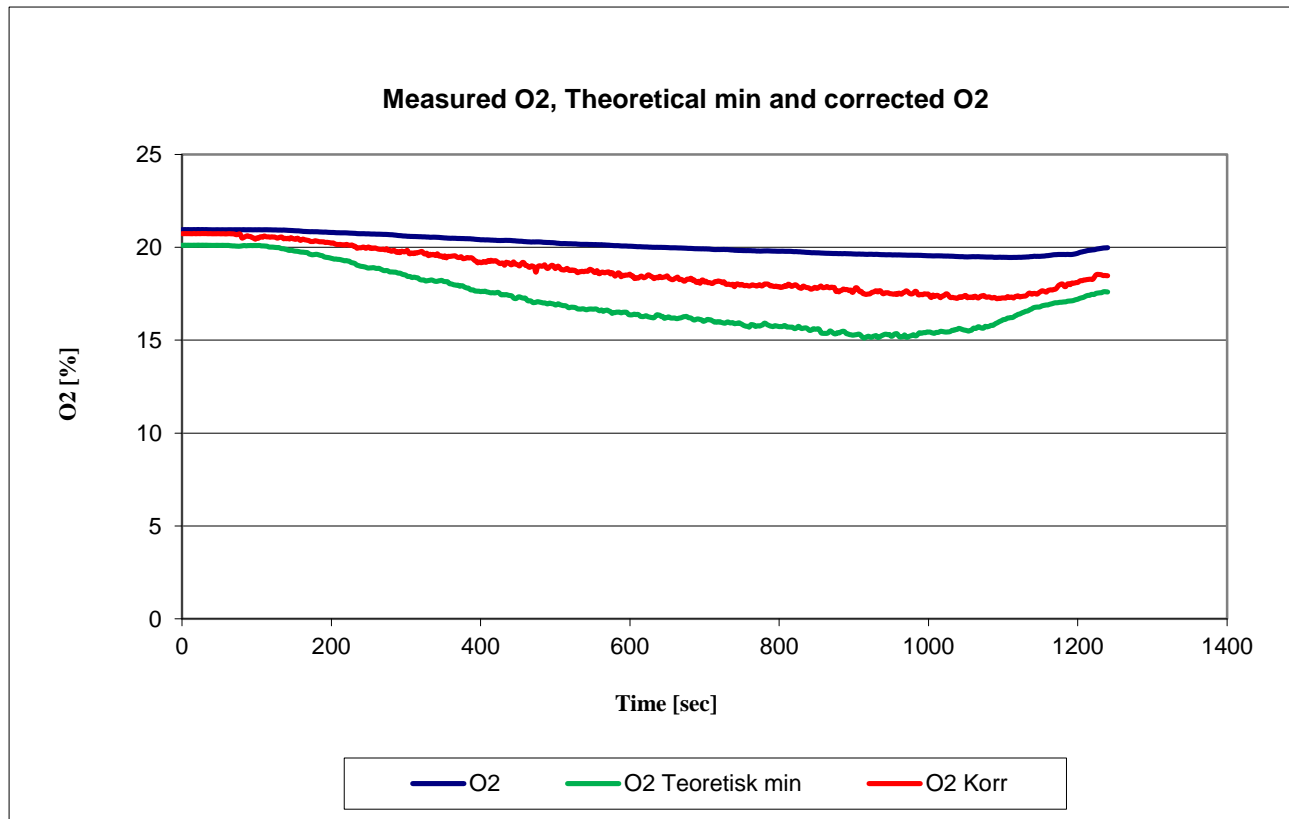
# Dry Oxygen measurement



# Measured Dry Oxygen Vs. Theoretical min



# Measured Dry Oxygen, Theoretical min and Corrected Oxygen



O2_min	[%]	19,57
O2_Theoretical_min:	[%]	15,11

# Thank you for the attention

Questions?