



# Number of measurements

## Theory versus Reality

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# Agenda

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Theory

Number of samples

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Method

Setting of measurements

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Results

Unexpected challenges

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Conclusion

Learnings and outlook

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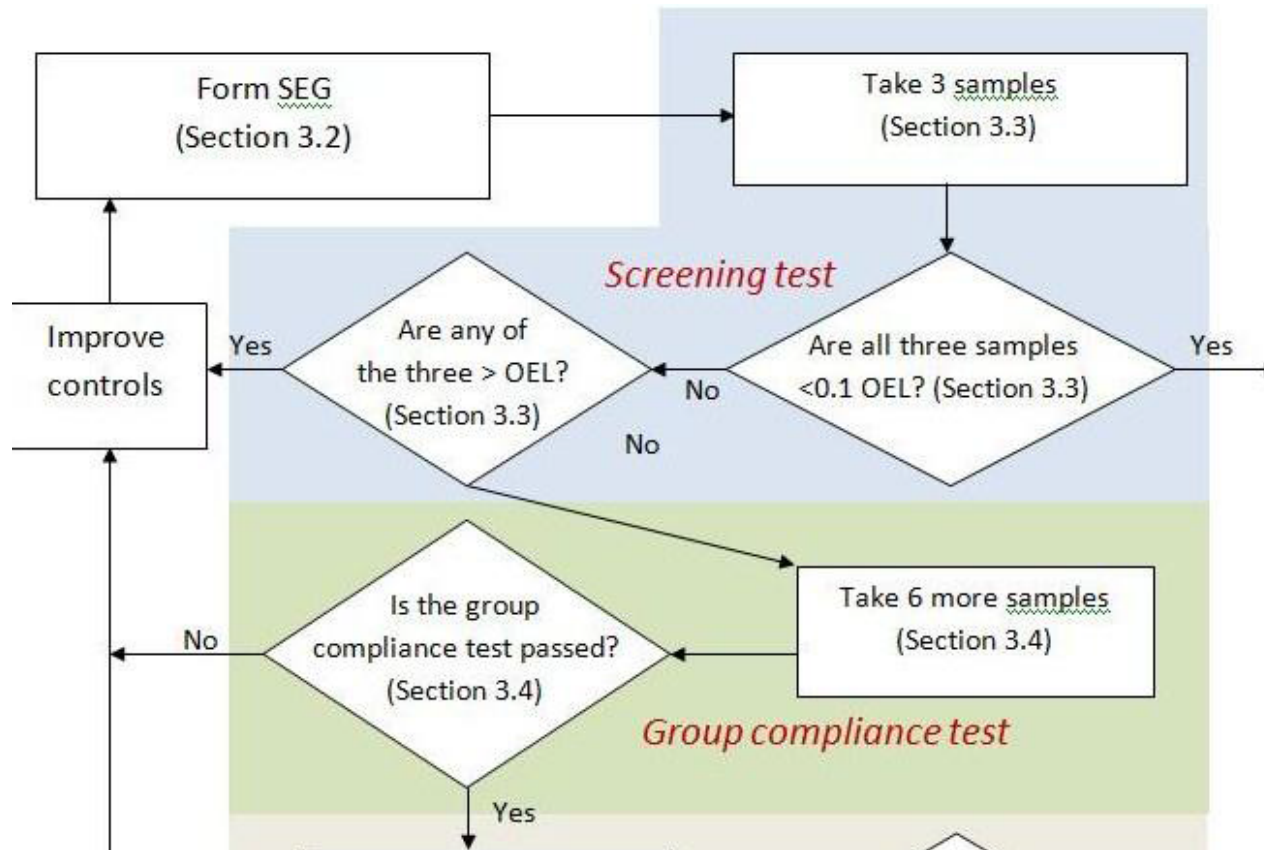
# Theory

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«One measurement is no measurement.»

- High exposures are always possible  
→ several measurements
- Several results in same range  
→ certainty that situation is normal
- 6 samples are needed for reliable result  
→ For every exposure location without exceptions?

# Theory



Source: "Testing Compliance with Occupational Exposure Limits for Airborne Substances." (accessed October 17, 2011).

# Theory vs. Reality

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## Time

- Mono-plant vs multiproduct plant
- Personnel resources (sampling engineer, line manager, operator,...)

## Costs

- Personnel resources
- Measurement equipment
- Analytics
- Extra effort

## Unexpected challenges...

# Setting

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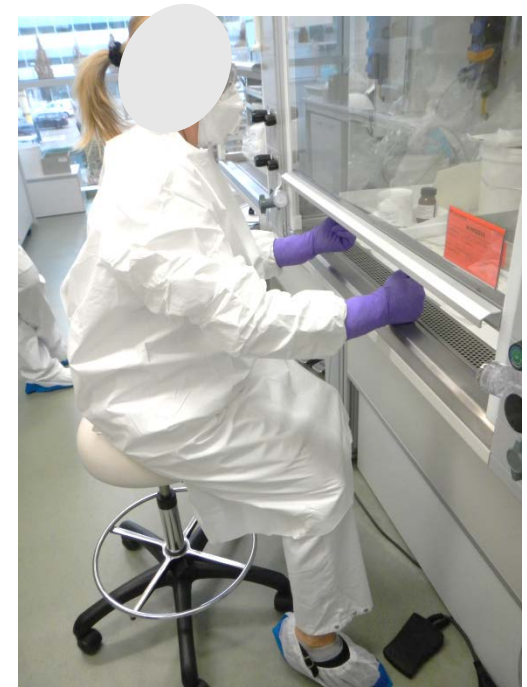
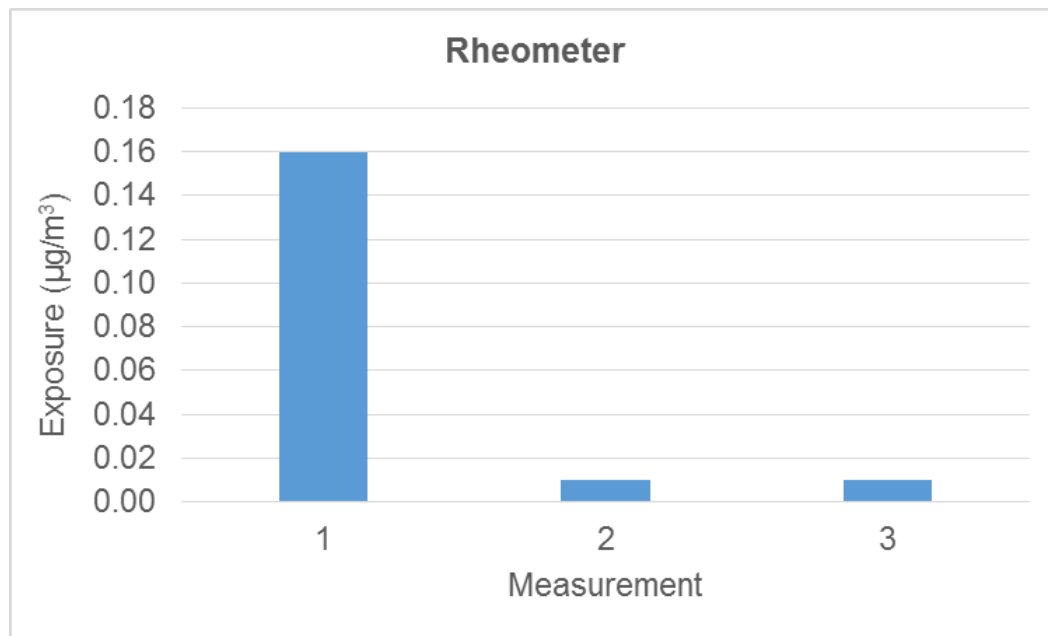
- Various companies (pharmaceutical /chemical industry)
- Various processes
- Multiple measurements (personal monitoring)



- Same conditions, different operators
- Purpose: Use of appropriate ppe (respiratory protection)

# Results

- Process: Performance of 6 powder tests (with Rheometer in a fume hood)



# Results

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- Process: Performance of 6 powder tests (with Rheometer in a fume hood)

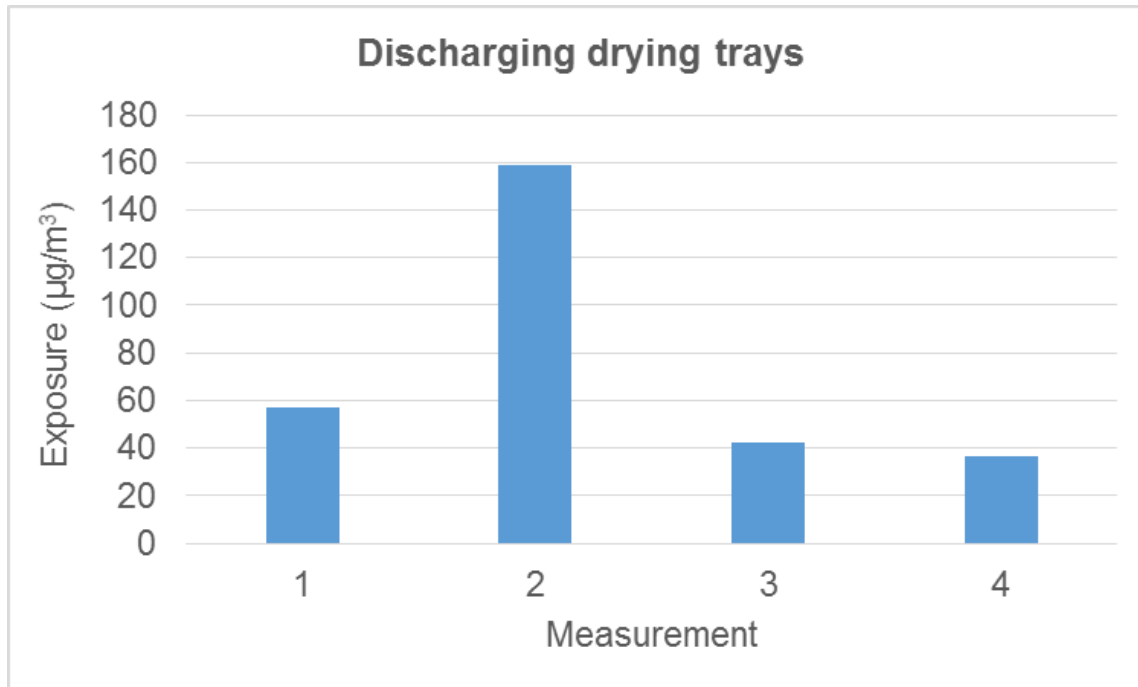




# Results

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- Process: Discharging of drying trays



# Results

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- Process: Discharging drying trays

1st  
measurement

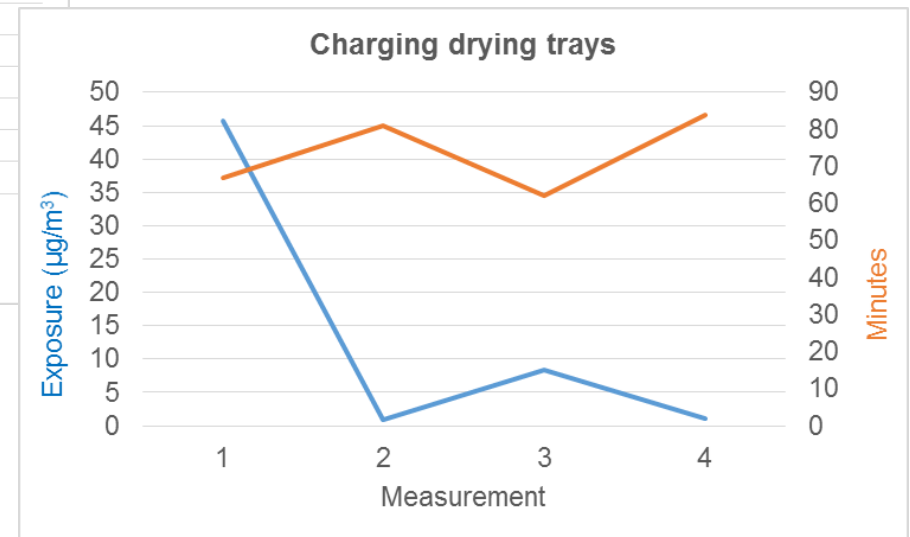
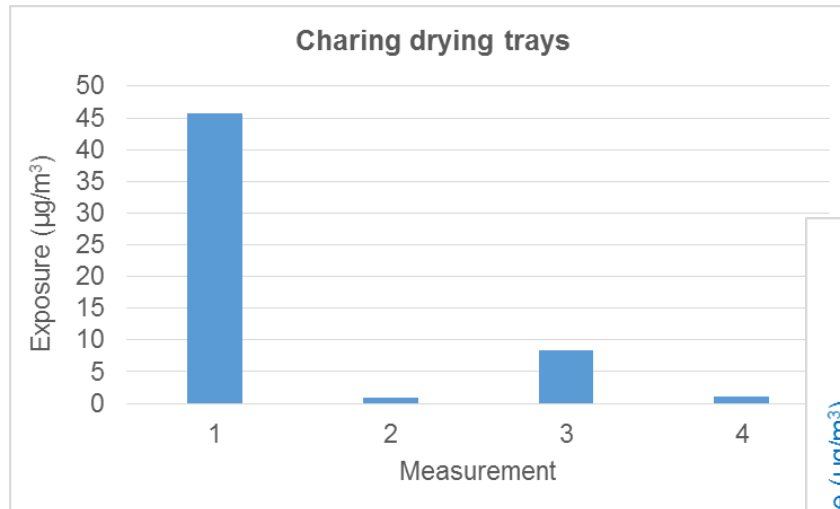


2nd  
measurement



# Results

- Process: Charging drying trays



# Results

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- Process: Charging drying trays

1st measurement



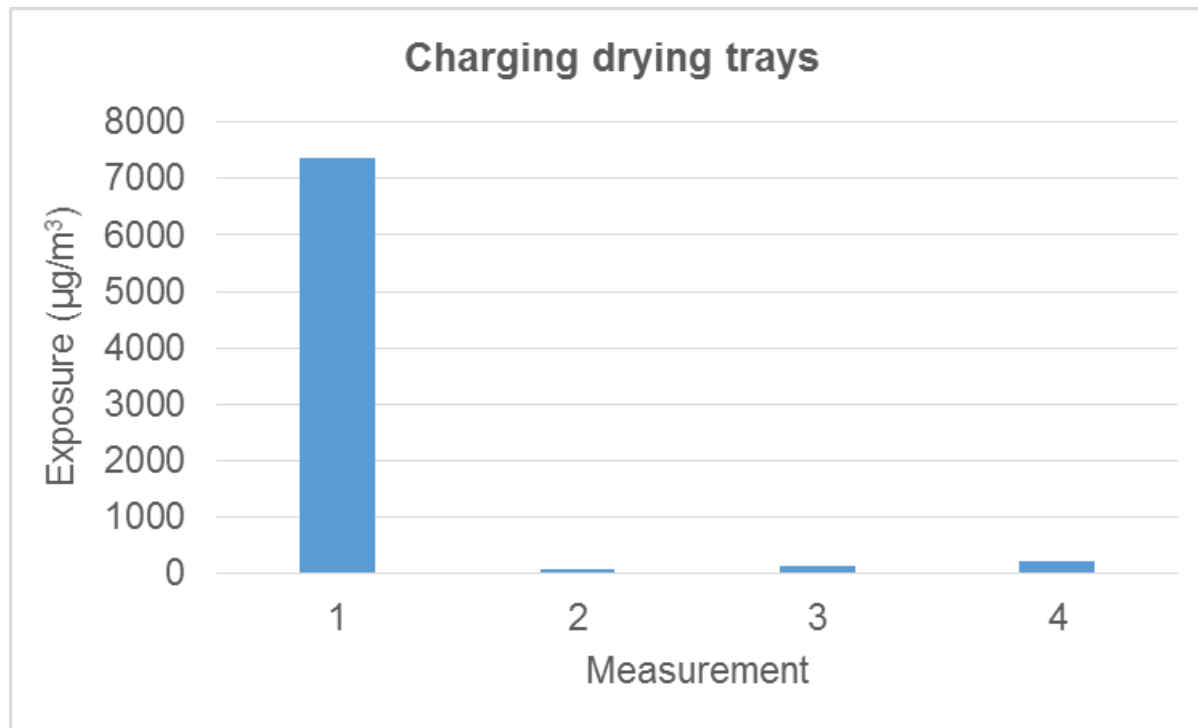
2nd measurement



# Results

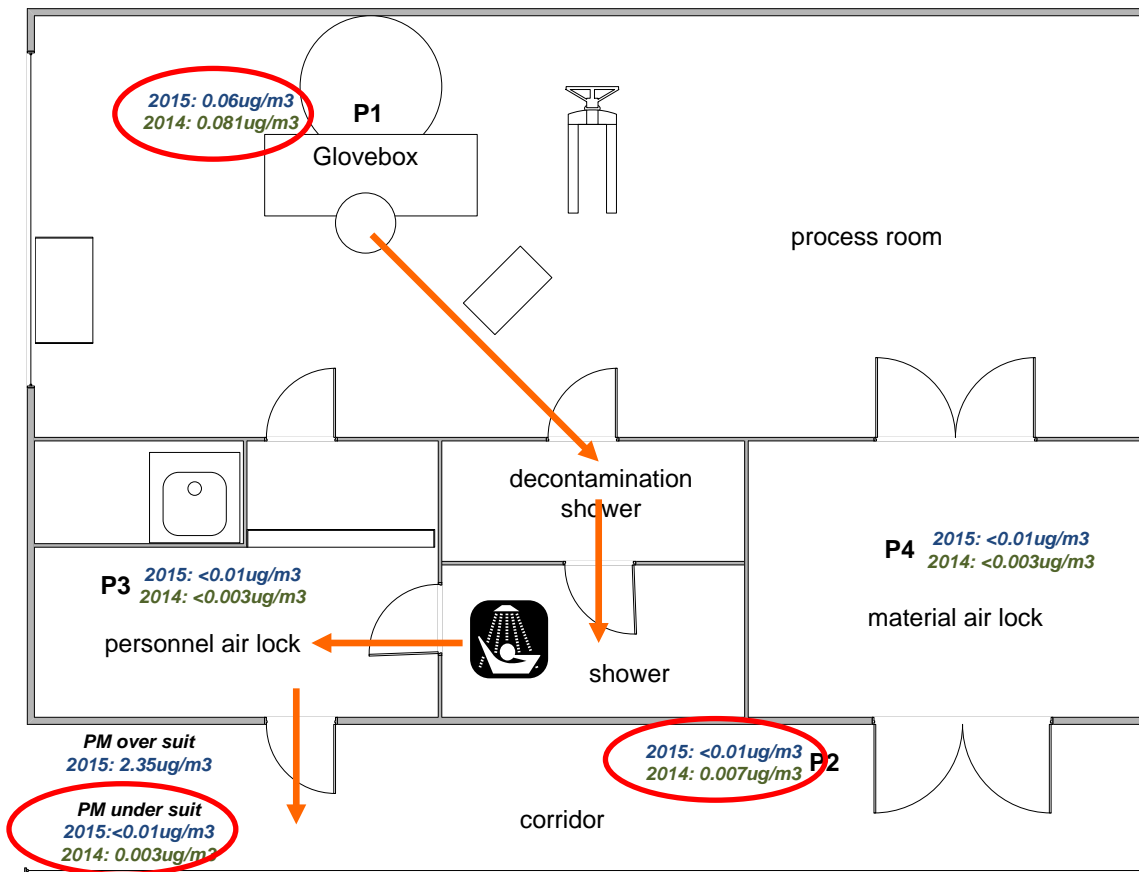
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- Process: Charging drying trays with extraction cabinet



# Results

- Process: Unloading Dryer into drum via glovebox



# Conclusion

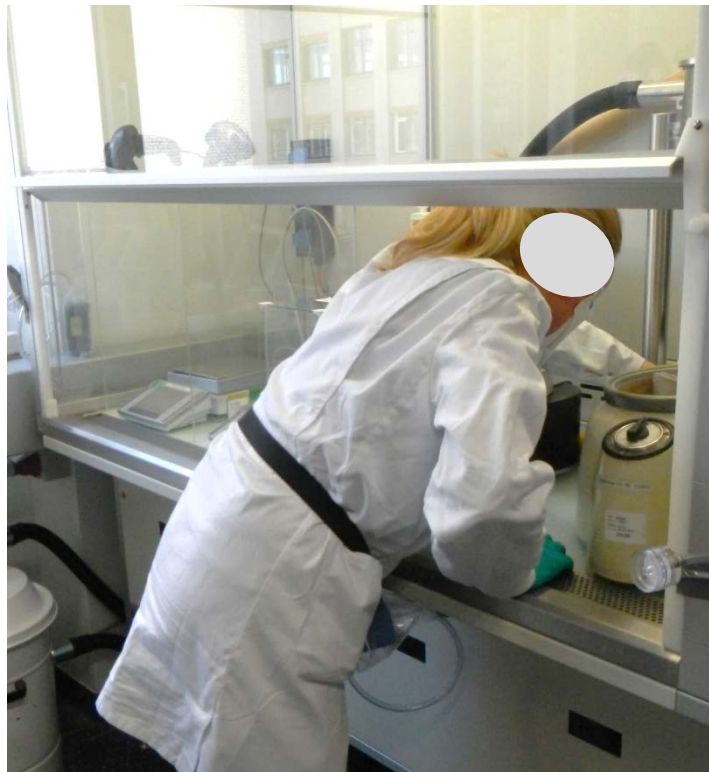
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- In praxis: Values over several measurements show high variability!
- Conditions are comparable, but not identical over several measurements.
- Various challenges have to be faced, some are not predictable.

# Human behavior

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- Incorrect use of facilities





# Human behavior

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- Social interaction
- Hazard perception



# Human behavior

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- Insufficient work preparation



# Conclusion

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- In praxis: Values over several measurements show high variability!
- Conditions are comparable, but not identical over several measurements.
- Various challenges have to be faced, some are not predictable.
- Human behavior has a major impact on the results of exposure measurements.

# Questions?

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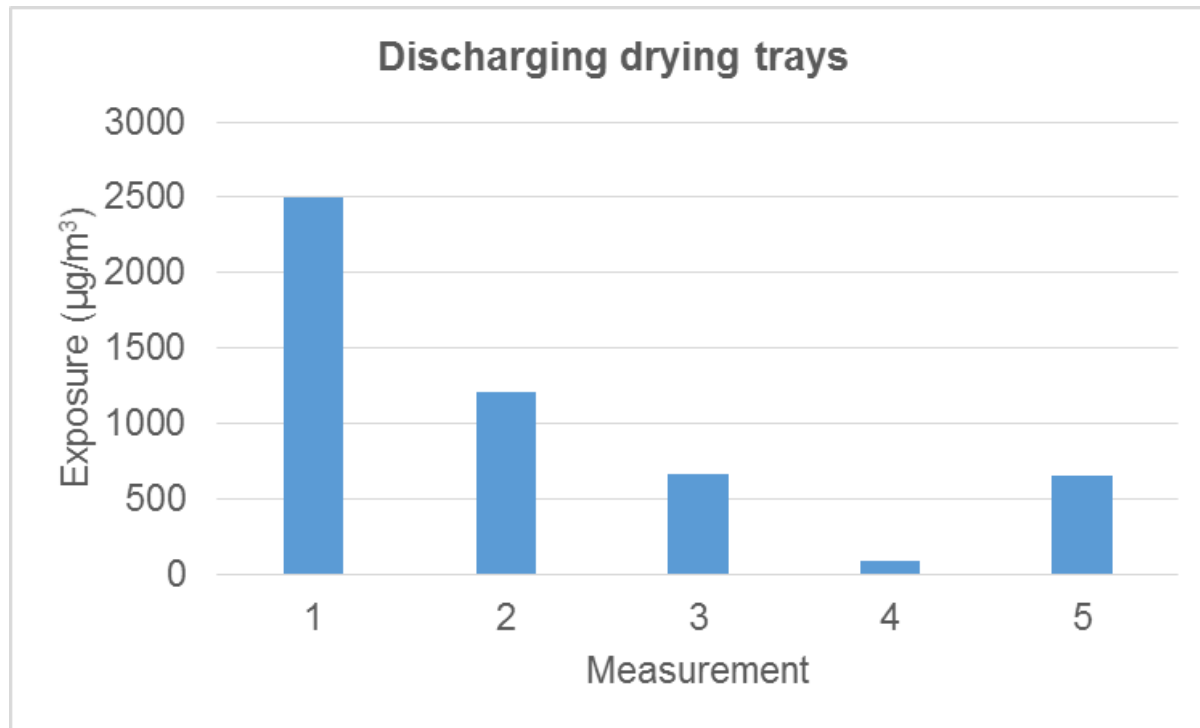
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# Thank you!

# Results

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- Process: Discharging drying trays with extraction cabinet



# Results

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- Process: Discharging drying trays with extraction cabinet

1st measurement



2nd measurement



# Back up: Results

- Process: Weighing

