

The background of the slide features a scenic view of a waterfall cascading into a body of water, with white foam from the waves visible in the foreground. The sky is a clear, light blue.

Droplet Size Distribution after Liquid Entrainment in Horizontal Stratified Two-Phase Three-Field Dispersed Flow

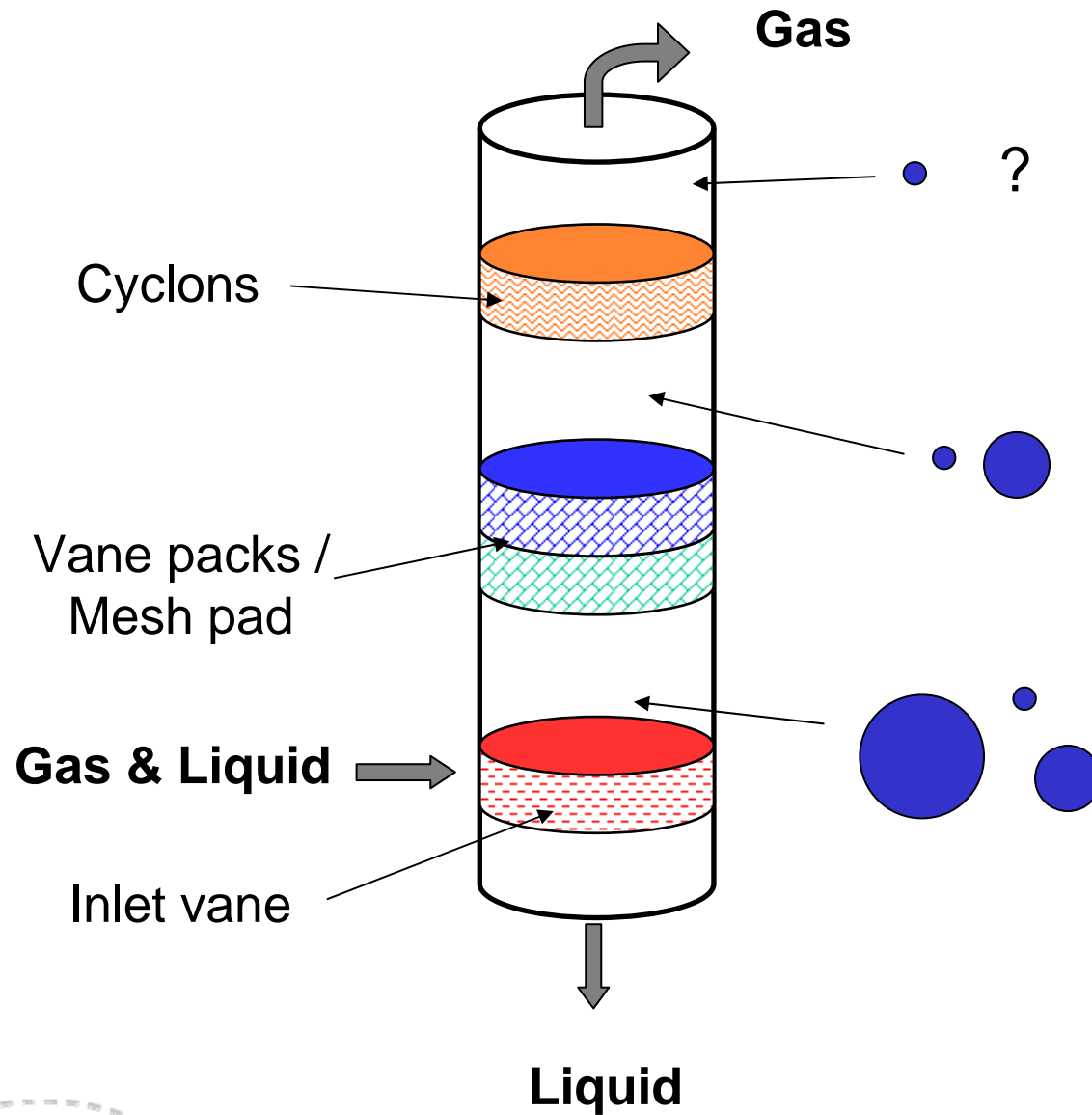
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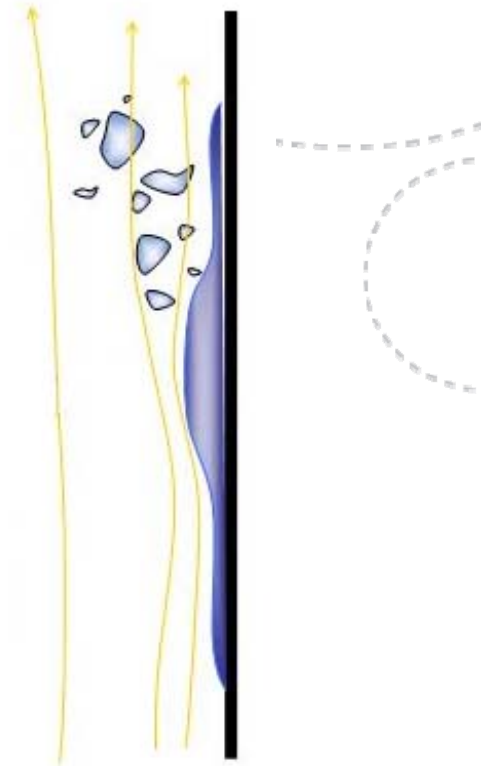


Gas and Oil extraction from the offshore platform “Oseberg C”

The droplet removal efficiency is reduced by the liquid entrainment



It is important to ensure no droplets in this level



Group behaviour analyzed via “Population Balance”

Entity ●

Is the behavior of one entity ruling the overall behavior ?



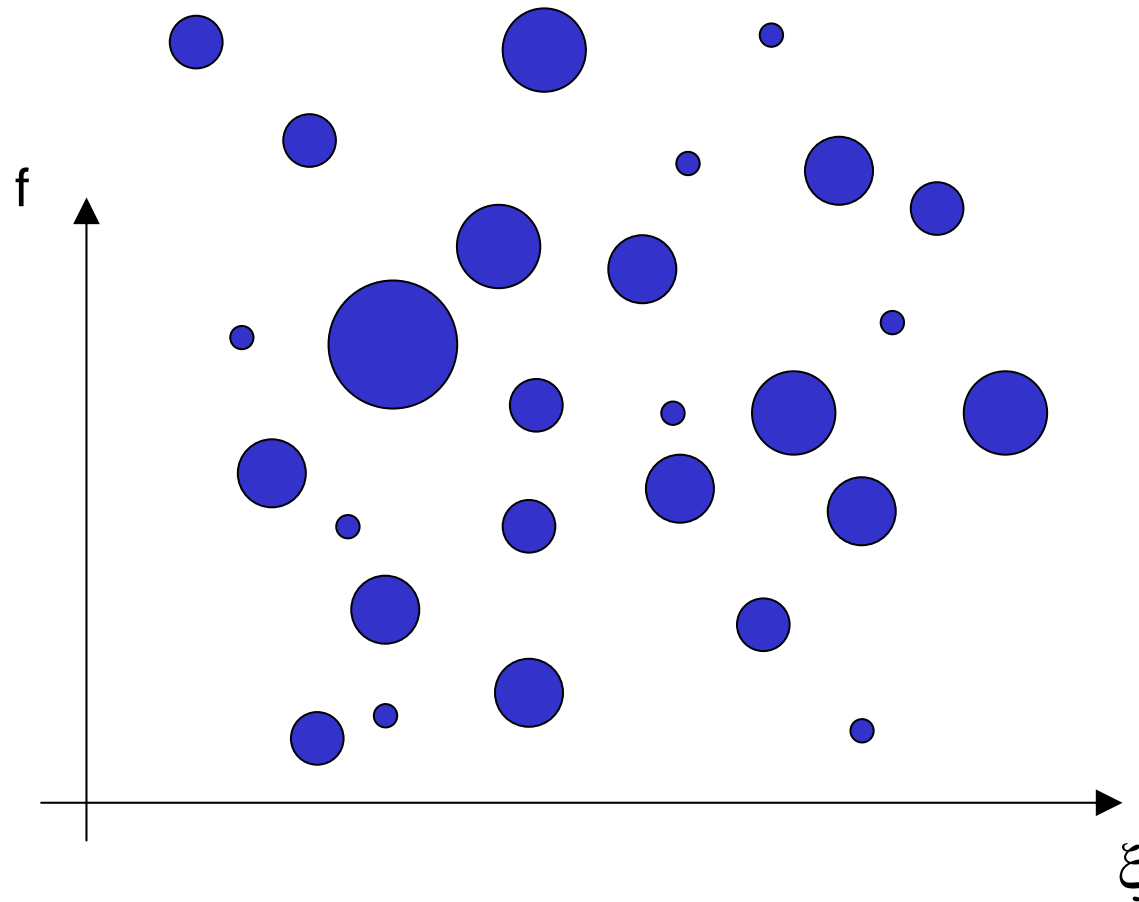
1. Introduction

2. Population Balance

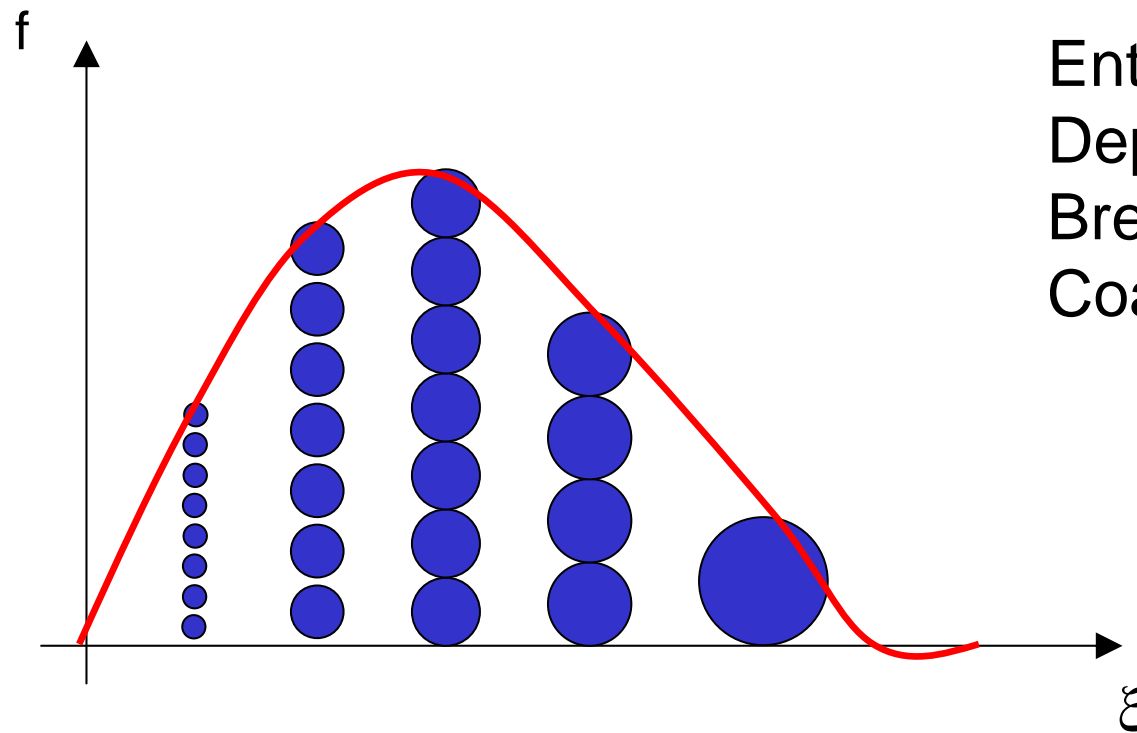
3. Entrainment from a wire

4. Entrainment from a surface

Population Balances uses an statistical approach to model the droplet phase



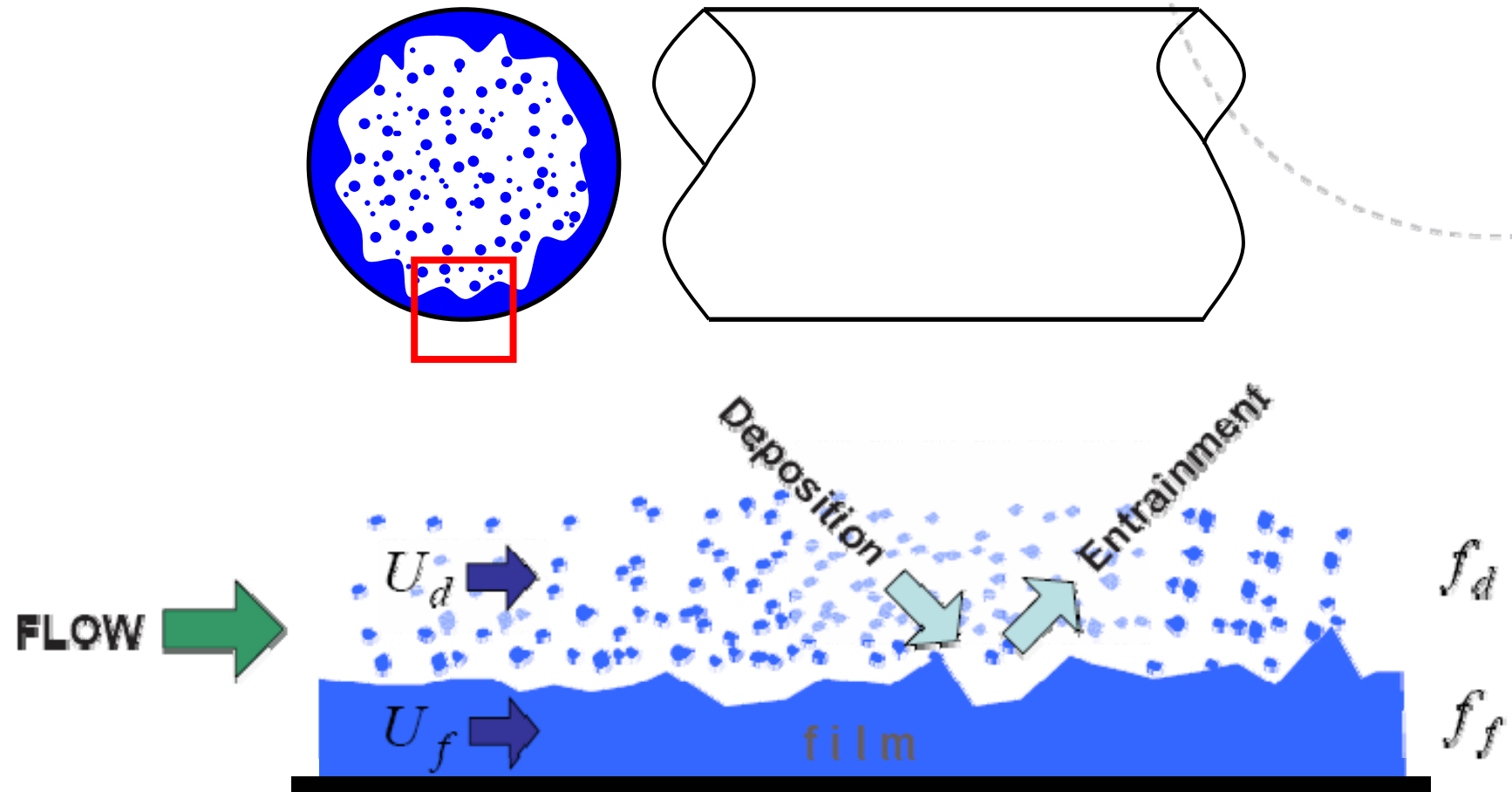
Population Balances uses an statistical approach to model the droplet phase



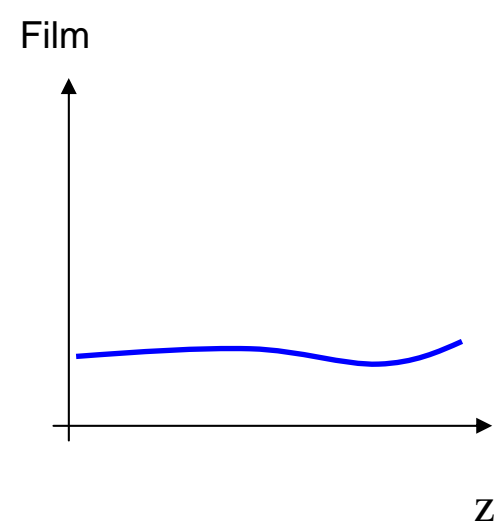
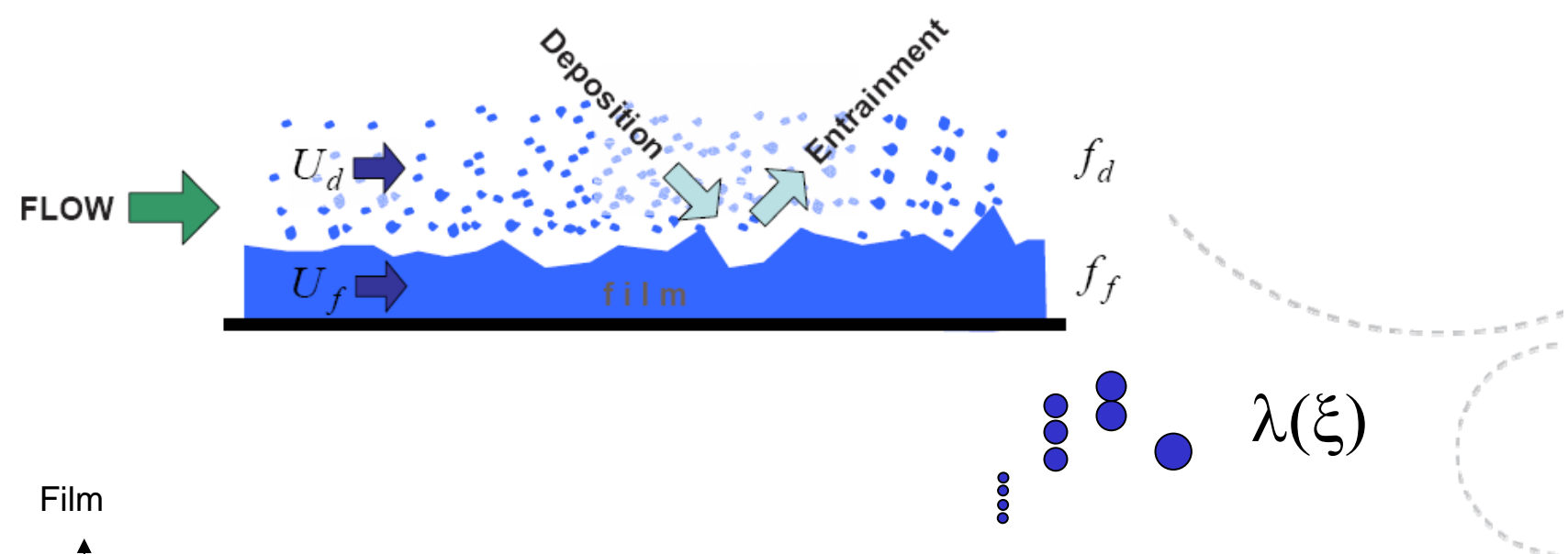
Entrainment
Deposition
Breakage
Coalescence

C.A. Dorao, L.E. Patruno, P.M. Dupuy, H.A. Jakobsen and H.F. Svendsen,
Modeling of droplet–droplet interaction phenomena in gas–liquid systems for natural gas processing,
Chemical Engineering Science (2008)

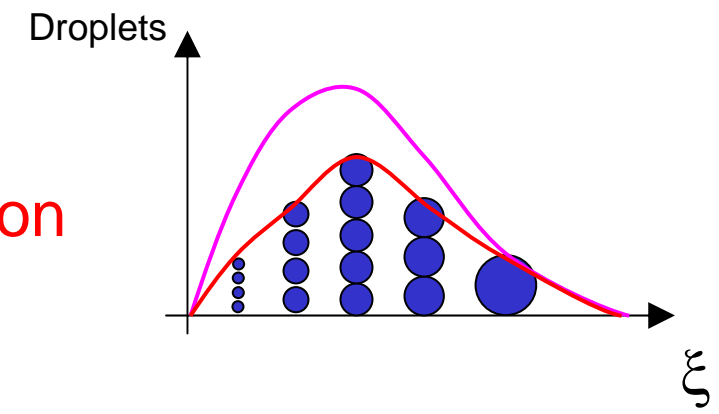
Entrainment / Deposition will modify the droplet size distribution



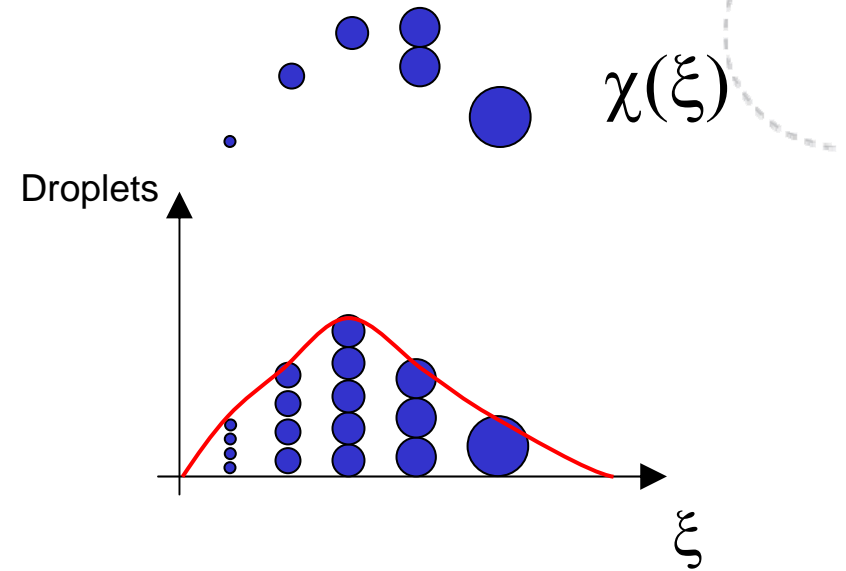
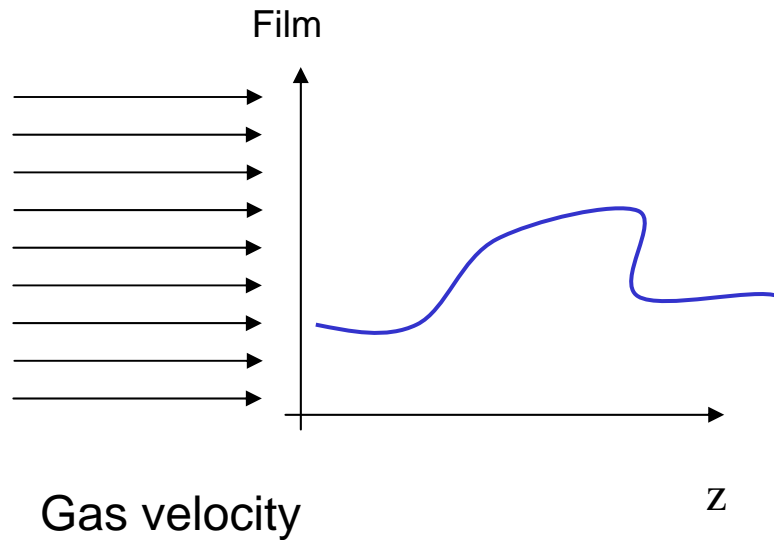
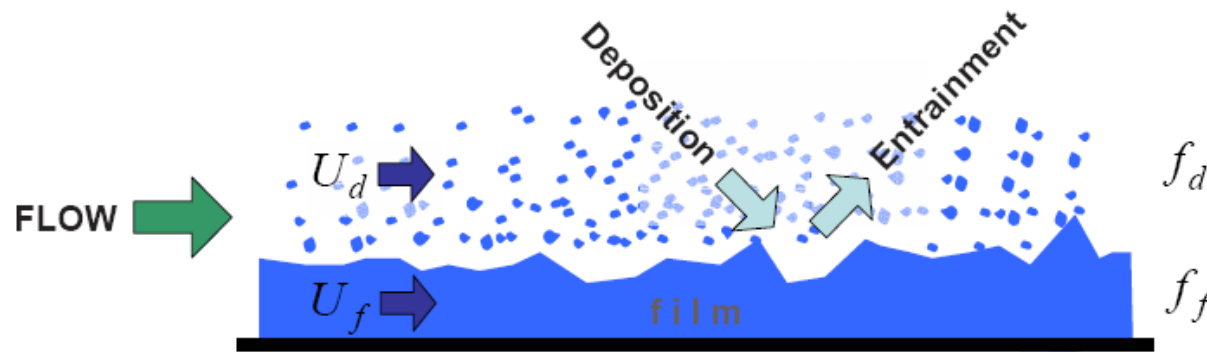
Entrainment / Deposition will modify the droplet size distribution



Deposition



Entrainment / Deposition will modify the droplet size distribution



Entrainment



1. Introduction

2. Population Balance

3. Entrainment from a wire

4. Entrainment from a surface

The idea is to simulate a local entrainment effect in a mesh pad

Decane - Nitrogen

Pressure: **8 – 16 bar**

Temperature: **23 C**

Surface tension: **24 mN/m**

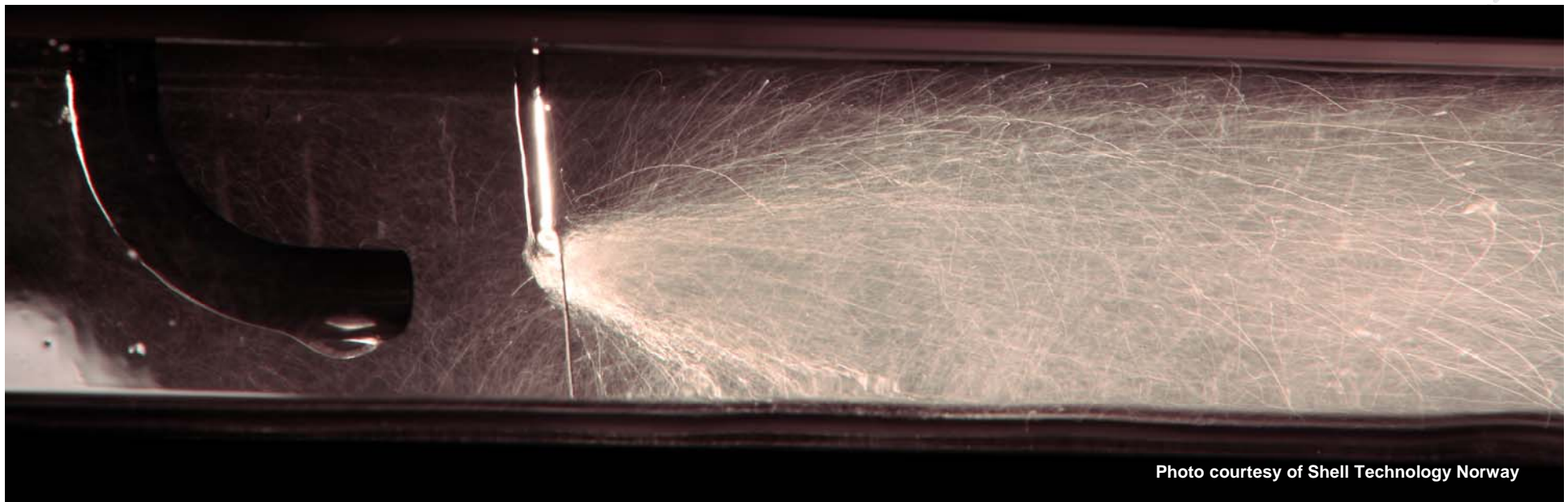


Photo courtesy of Shell Technology Norway

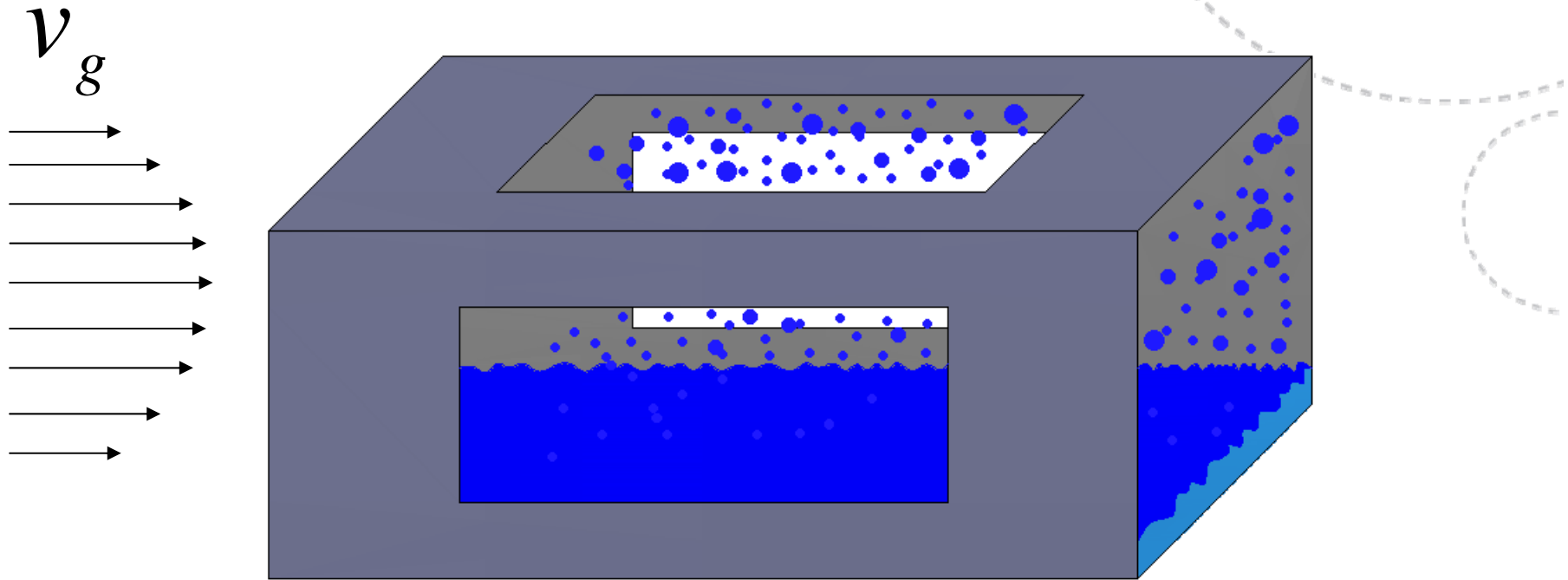
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First experiment consists of measuring the droplet size distribution generated by liquid entrainment from a flat surface



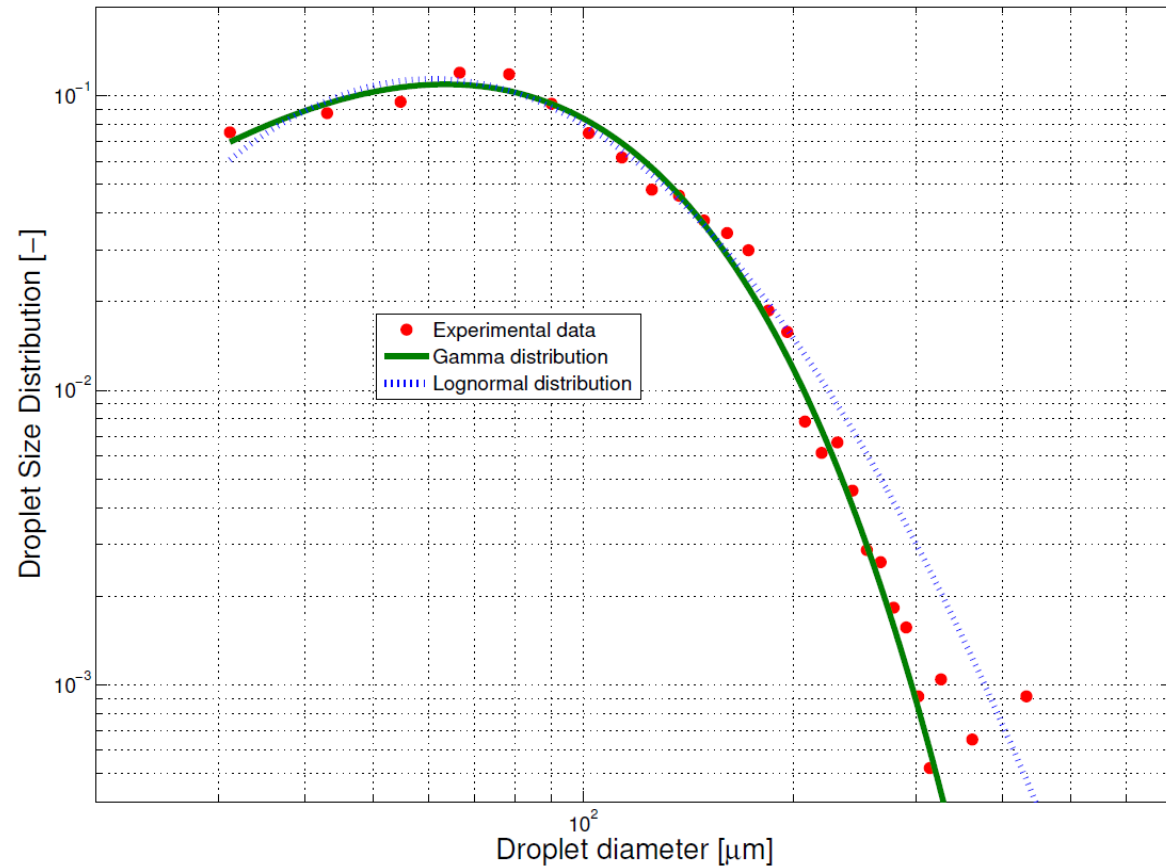
A *Gamma* distribution was fitted to the measured data

Exxsol - Nitrogen

Pressure: **8 – 16 bar**

Temperature: **23 C**

Surface tension: **24 mN/m**



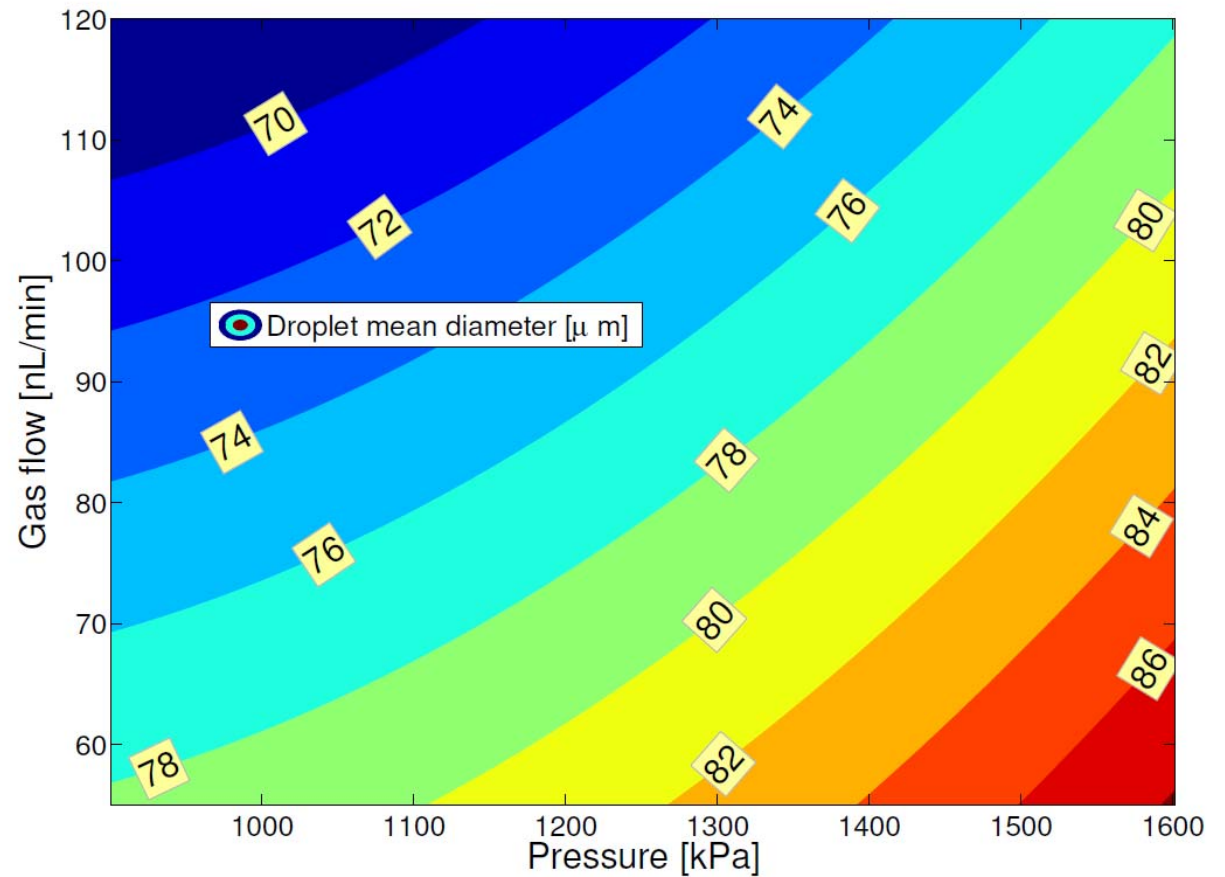
The mean droplet size was studied for different conditions and resulted to decrease with the gas flow rate

Exxsol - Nitrogen

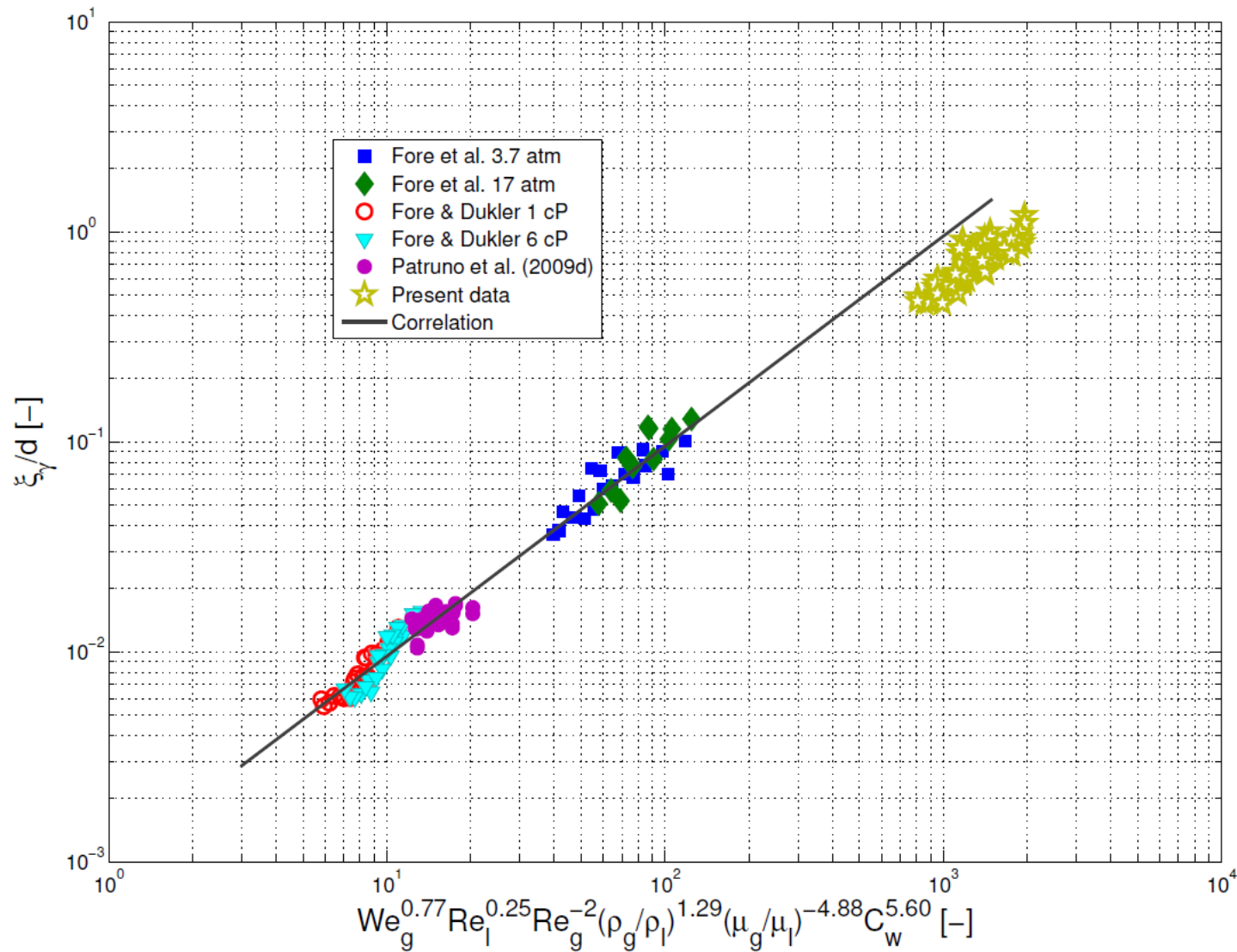
Pressure: **8 – 16 bar**

Temperature: **23 C**

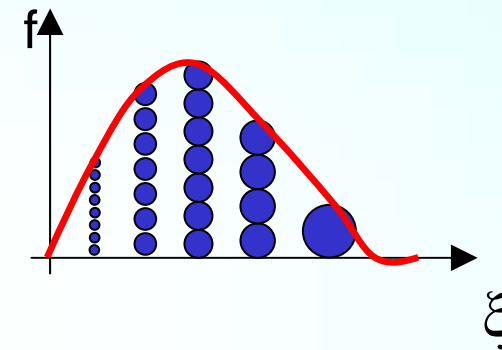
Surface tension: **24 mN/m**



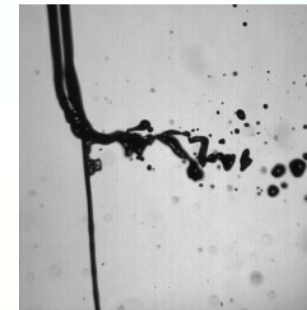
With all the mean diameter data sets we derived a correlation that collapses data from different geometries, systems and conditions



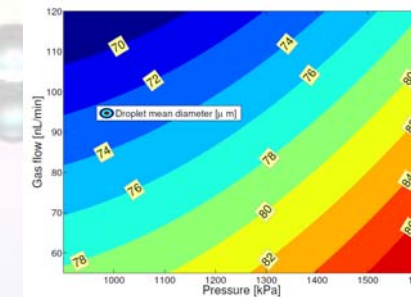
- An statistical approach for the description of a dispersed phase



- Entrainment from different geometries that represent a scrubber



- Analysis of the data, kernels and correlations to fit in models



Thank you for your attention