



## *Doreen McGough's Biography*

Doreen McGough has been the Occupational Health and Environmental Safety Manager for the IMnI since January 2009. Before joining the IMnI, she worked as a Regulatory affairs Specialist at Safeparm Laboratories Ltd UK - a Contracted Research Organization. Doreen, an environmental scientist, started her career as a lecturer across a wide range of scientific subjects at Nottingham Trent University where she had two peer-review papers published in the scientific press.

Dr. McGough graduated from the University of Buea – Cameroon, earned a master's degree at the Nottingham Trent University and a doctorate at the University of Nottingham - UK



# **A Proposed Solution to the Muddle of Global Occupation Exposure Limits (OELs)**

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## Overview

- Introduction: Definition of OEL
- The Problem
  - OEL Derivation, Who? How? The Reality!
  - Decreasing OEL values and Global variation
  - Industry
- The Research
  - Aim
  - Methodology
  - Results
- The Proposed Solution
- Cost & Source of samplers
- Some Conclusions



## Definition of OEL

### Scientists/Occupational hygienists:

“That” amount of substance, which workers can be exposed to over 8-hr per day, 5 days per week in their working life, without getting sick

### Regulators:

As the maximum permissible concentration of a chemical agent in the air at the workplace to which workers may be exposed in relation to an 8-hour or a 15-minute reference period

### Lawyers:

A legally enforceable limit on the amount or concentration of a substance in the workplace to which employees/workers may be exposed to during a specified period of time

### Politicians: ...

“Let’s play it safe ...Whatever the market can bear.”



## Types of OELs

### Inhalable:

The fraction of airborne particles that enters the nose, throat & lungs during normal breathing. It is made up of particles of 100 microns in diameter and less.

### Respirable:

This fraction measures particles of approximately 5 microns and less. It certainly penetrates into the gas exchange region (alveoli) of the lungs, and is therefore the most hazardous particulate size.

### Total:

Covers all airborne dust but actually includes slightly less of the coarser dust than inhalable.

### A Mix of the Above: ...

## OEL Derivation - Who?

- The Group of Those Responsible
  - Regulators
  - Insurance Companies
  - Politicians
  - Pressure groups representatives
  - Scientists/ Researchers...



*“The R. I. P. P. S.”*

Agenda

- Develop an OEL
- or Reduce the existing OEL



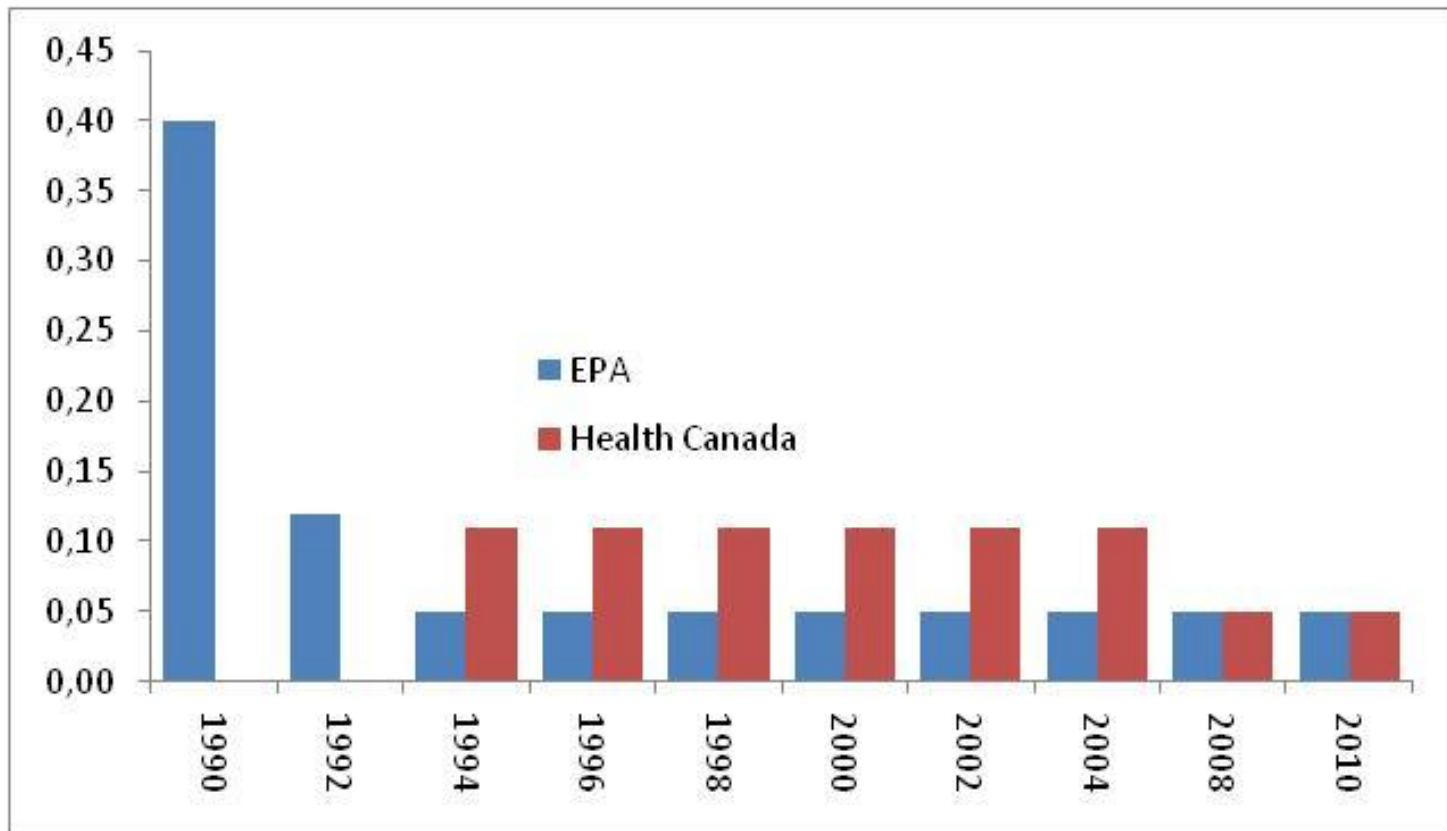
## OEL Derivation – How?

- Literature Review:
  - Score studies for reliability
  - Choose a variety of studies as key studies
- Initiate Research:
  - To fill data gaps or key studies' shortfalls
- Monitoring data:
  - Use inhalable and respirable fractions
  - Use well-documented data
- Uncertainty factors:
  - No uncertainty factors should apply

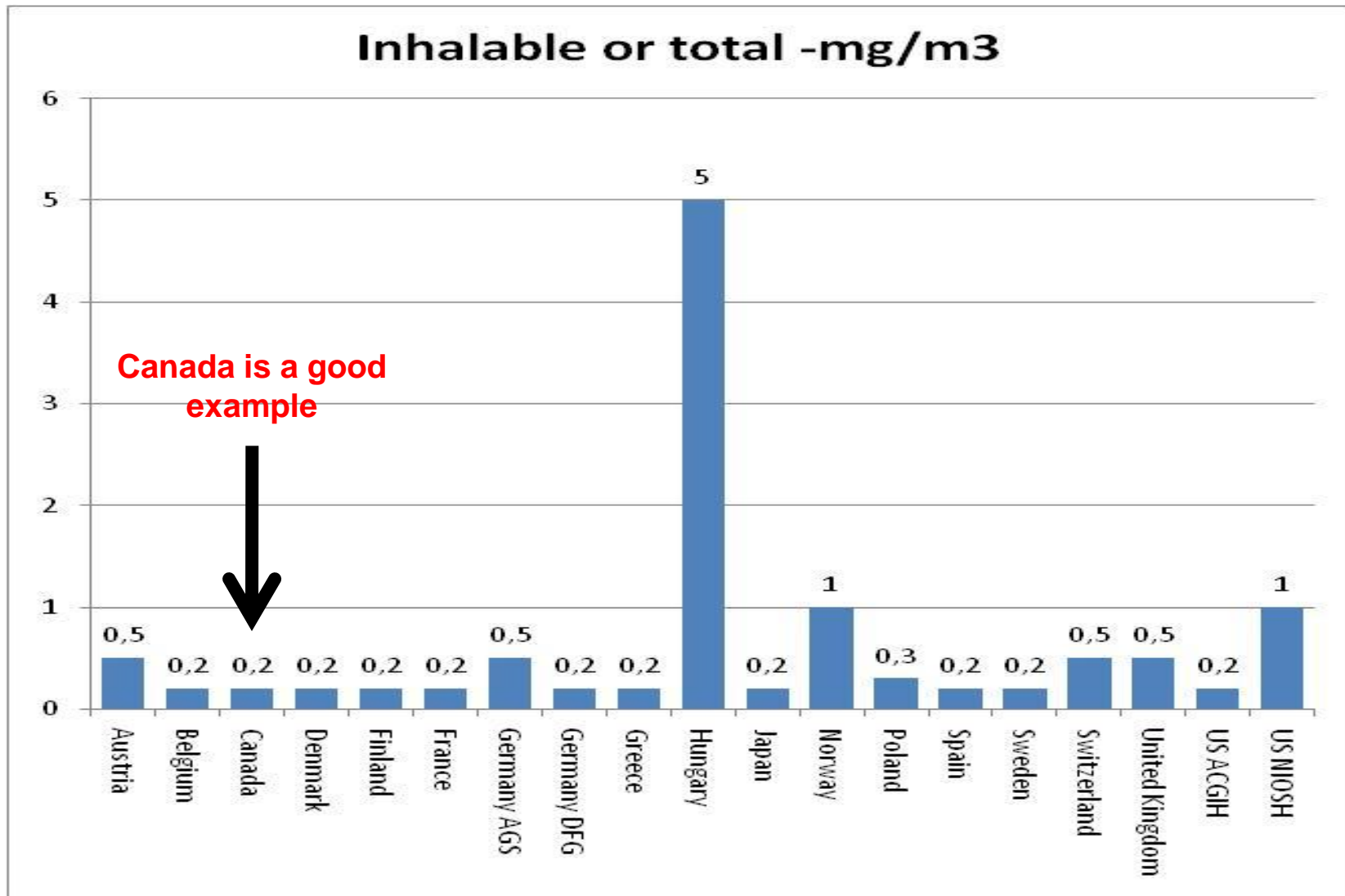
## OEL Derivation – The Reality!

- Another country's OEL
- Use a No Observed Adverse Effect Level (NOAEL) from a study
- Pick a value from industry's monitoring data that led to a litigation claim
- Precautionary principle - adding uncertainty factors
- Safety Data Sheets
- Influence from the local community & pressure groups could lead to the reduction of existing OEL
- Due to lack of resources or time, no additional research is carried out
- ...

# The Problem – Decreasing OEL values



## The Problem – Global variation





## The Problem - Industry

- Industry monitors work place exposure using different measuring methods
- Raw data acquired from measurement is analysed differently
- The measurement frequency is different
- The monitoring devices used are different
- Method of storing acquired data are different
- Hence results cannot be compared even between companies/sites or countries

## The Research-Aims/Objectives

- IMnI identified the problem in 2008, contracted the Institute of Occupational Medicine (IOM), UK, to propose a harmonised method for measuring Mn exposure in the workplace

### Aims:

- Identify or propose a reference method for measuring Mn exposure in the workplace
  - The proposed reference method should be simple, but efficient

## The Research – Methodology (1)

### Step 1 - Identification of samplers:

- Bench mark samplers currently used
- Choose samplers that meet the definition of inhalable & respirable
- Samplers that are easy to use, widely available, cheap & comply with national regulatory requirements

### Result:



**IOM inhalable head**

Inhalable dust



**Higgins Dewell Cyclone**

Respirable dust



**Conical Inhalable Sampler (CIS)**

Inhalable & Respirable

## The Research- Methodology (2)

### Step 2 – Identification of existing methods:

- Literature review of available sampling methods
- Collection of information on sampling methods used in the Mn industry.

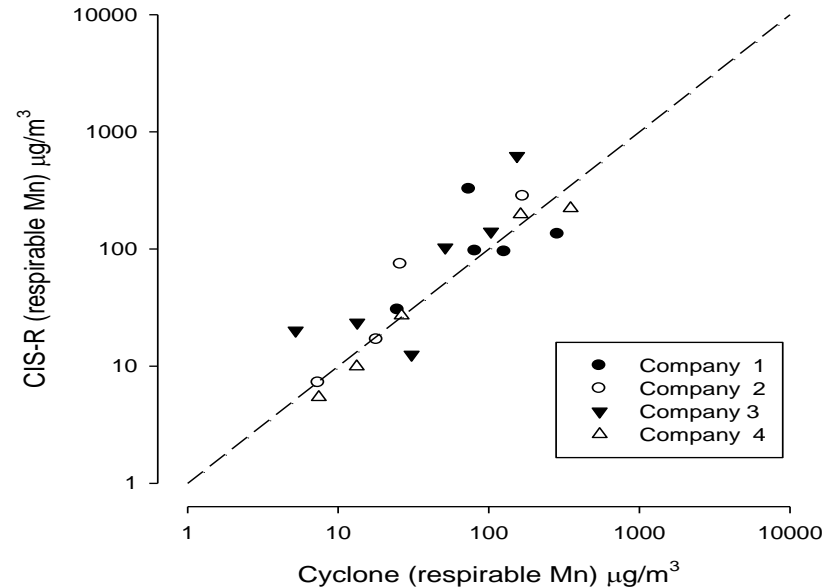
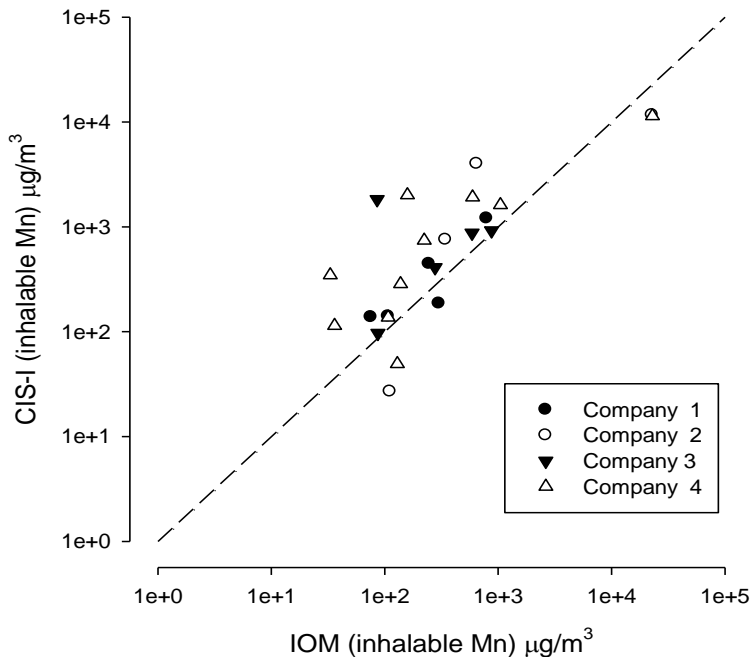
### Step 3 - Field comparison of selected methods:

- Four different company sites handling 7 different types of Mn-based substances
- Measurements were carried out on full-shift using all 3 selected samplers side-by-side for one week
- Personal & Static measurements were taken
- Employees were briefed about the importance of the study
- Field blanks collected at the 4 sites and used to correct exposed samples

## The Research- Results (1)

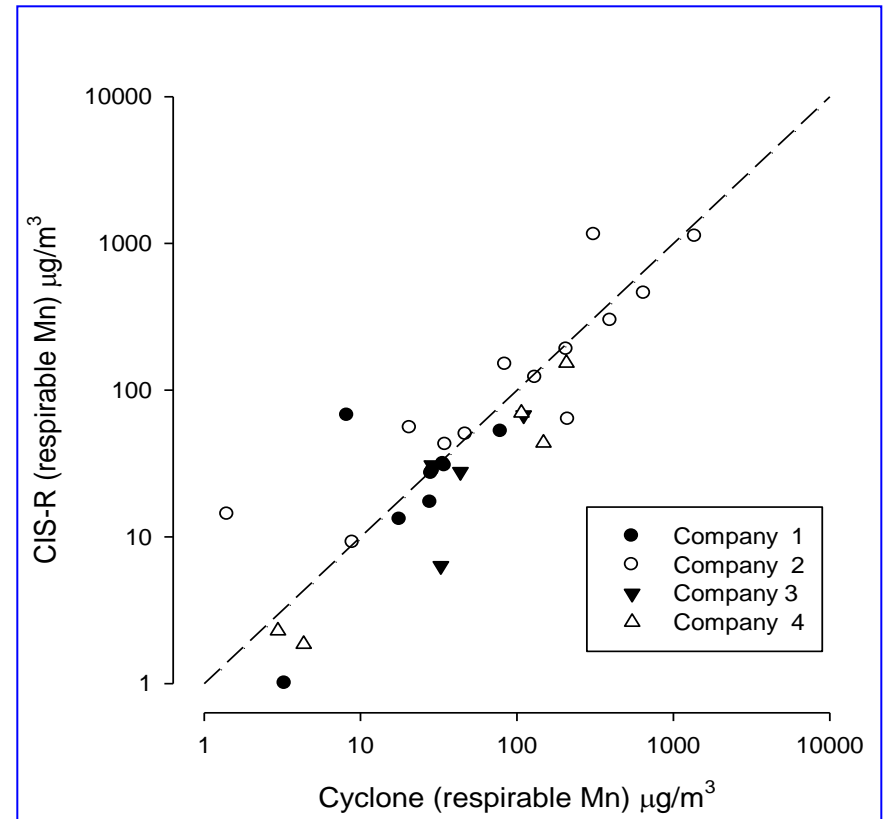
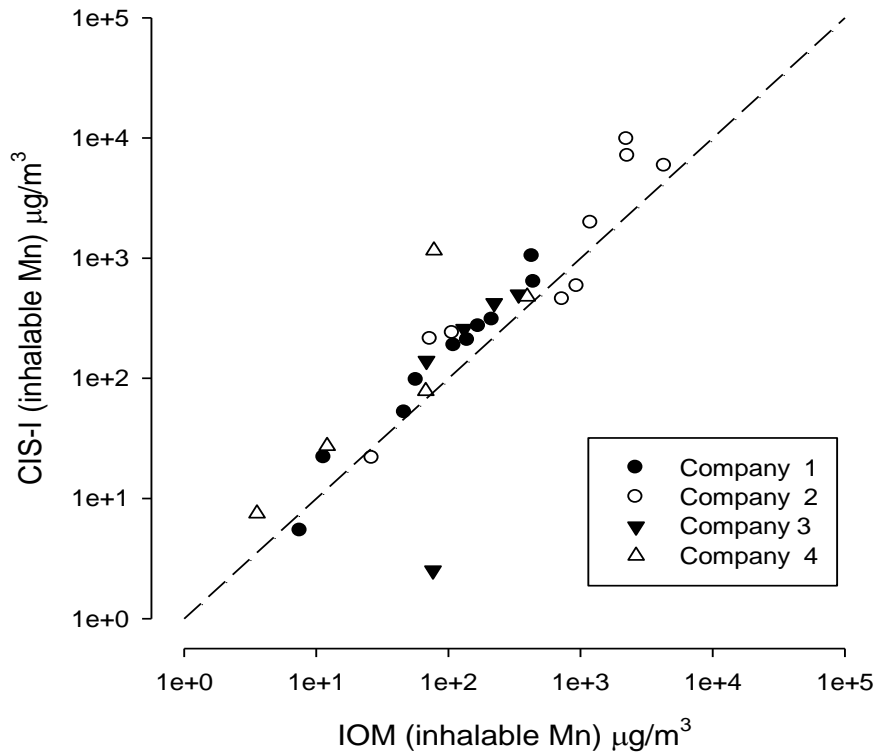
Samples were analysed by gravimetric (sampler efficiency) & chemical (total Mn content) analysis

Results for personal inhalable & respirable Mn concentration:



## The Research- Results (2)

Results for static inhalable & respirable Mn concentration:



## The Proposed Solution

- The harmonised reference method proposed is titled:  
“Guidance for the Collection of Inhalable & Respirable Airborne Manganese Dust”
- It can be downloaded free from [www.manganese.org](http://www.manganese.org)
- It is divided into the following 5 sections:
  - Which samplers to use and how to operate them
  - Procedures to carry out for personal & static sampling
  - How to handle field blanks
  - How to store and transport collected samples to minimise loss/contamination
  - Details on sample analysis



## Cost & Source of samplers

### Proposed samplers cost (£)

Sampler Parts	IOM head	HD cyclone	CIS
Sampler body	43	42	50
Sampling cassettes	7	5	13
Sampling medium	23	30	130
Total cost of 5 samplers	256	343	355

### Proposed samplers source:

Sampler	Suppliers		
	Casella Measurement	SKC Ltd	JS Holdings
IOM head	✓	✓	
HD cyclone	✓	✓	✓
CIS	✓		
Webpage	<a href="http://www.casellameasurement.com/">http://www.casellameasurement.com/</a>	<a href="http://www.skcinc.com/index.asp">http://www.skcinc.com/index.asp</a>	<a href="http://www.jsholdings.co.uk/index.asp">http://www.jsholdings.co.uk/index.asp</a>
E-mail	<a href="mailto:info@casellameasurement.com">info@casellameasurement.com</a>	<a href="mailto:skcinc@skcinc.com">skcinc@skcinc.com</a>	<a href="mailto:info@JSHoldings.co.uk">info@JSHoldings.co.uk</a>
Offices	US, UK, Spain & China	US, UK & South Africa	UK

## Conclusion

- The proposed reference method is freely available, simple to read and use, with very clear step-wise instructions
- The use of the same sampling method will allow for making comparisons between sites, companies and countries
- It will facilitate the derivation of appropriate international inhalable and respirable OELs
- Will help identify efficiently areas within plants with high or low Mn concentrations
- Using the same collection and analytical method will increase reproducibility, accuracy and precision



Thank you!

1 method! 1 OEL! 1 Message