International Cadmium Association

10th ICdA H&S Ctee

October 23th 2012

Statement of Compliance

- The purpose of the meeting is to address, under the applicable confidentiality rules, issues concerning cadmium and cadmium compounds producers and users and more particularly H&S issues, as reported in the Meeting's objectives .
- The minutes kept at the meeting will have to reflect all significant matters discussed during the meeting.
- No discussions will be held, formally or informally, during specified meeting times or otherwise, involving, directly or indirectly, express or implicit agreements or understandings related to: (a) any company's price; (b) any company's terms or conditions of sale; (c) any company's production or sales levels; (d) any company's wages or salaries; (e) the division or allocation of customers or geographic markets; or (f) customer or suppliers boycotts; or (g) any disclosure of information which may affect applicable rules on Competition Law.
- The International Cadmium Association, as a group will make no recommendations of any kind and will not try to reach any agreements or understandings with respect to an individual company's prices, terms or conditions of sale, production or sales levels, wages, salaries, customers or suppliers.

Objective of H&S Com meetings

- Reminder:
  - The H&S Ctee was set up **primarily** to assist ICdA members with the implementation of the ICdA Guidance document
  - "ICdA Guidance on the management of the risk related to chronic occupational exposure to cadmium and its compounds"
- Source of this initiative:
  - Cd/CdO risk assessment (RA) shows a conclusion that there is a risk to workers under current management methodologies (2007)
  - Under the current "REACH" regulation, the same "risk management precautions" apply, for Workers and for the Environment

Past (and future) H&S Ctees

- Launch of the committee, definition of the format and content
  - 1st Ctee, dated Nov 25th, 2008
- Measuring air quality
  - 2nd Ctee, dated March 10th, 2009
- Medical supervision adapted to cadmium risk
  - 3rd Ctee, dated June 16th 2009
- Individual and collective hygiene procedures
  - 4th Ctee, dated October 13th, 2010
- Detailed procedures regarding medical surveillance
  - 5th Ctee, dated June 8th: 2010
- Status a the REACH registration process
  - 6th Ctee, dated October 15th, 2010
- Choosing and maintaining the right PPE
  - 7th Ctee, dated June 7th, 2011
- Implementing a prevention culture in our facilities
  - 8th Ctee, date to be set: October 15th, 2011
- Communication flyers and Guiodance ICdA
  - 9th Ctee, : June 17th, 2012
- **Water treatment- emissions minimization**
  - **10th Ctee, October 23th , 2012**
- Next meeting (tbd)
  - 11th Ctee, date to be set

Agenda for Today's meeting

- Introduction: - Welcome / Agenda / Competition law compliance
  - Objectives of the meeting: minimisation of water Cd-releases
- Approval of the minutes of the 9th H&S committee (June 19th 2012)
- Cd-water releases minimization:
  - Experience at SNAM
  - Waterframe work directive

-Lunch-

- Occupational Cadmium Bio Indicators Observations:
  - Review of OCdBio 1,2, 3 & report by prof. Bernard of OcdBIO 4 report (data 2011)
  - Comments & discussion
- Setting of the 12th H&S committee and … longer term planning

Water emissions minimization SNAM experience

Eric Nottez– President SNAM

23rd October 2012

WATER TREATMENT SNAM EXPERIMENT

Agenda

- Why was water a concern for SNAM ?
- What are the key factors external to SNAM ?
- What are the internal key factors ?
- Which principles to be used ?
- Which technologies are available ?
- Some first results

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Water Concern in SNAM : why ?

- "Zero Level" of non ferrous metal wasted in water before the end of 2020
- Water directive, as transposed, incudes higher concern for biotic assets :
  - **Frequent Studies**
  - **Acidity (pH restrictions)**
  - **Quantities rejected**
  - **temperature**
- "Seveso" applies to recycling activities since 2011 (decrees) bringing higher controls and expectancies…

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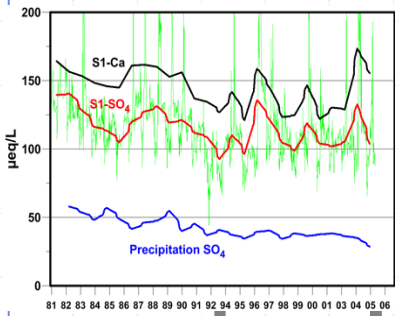
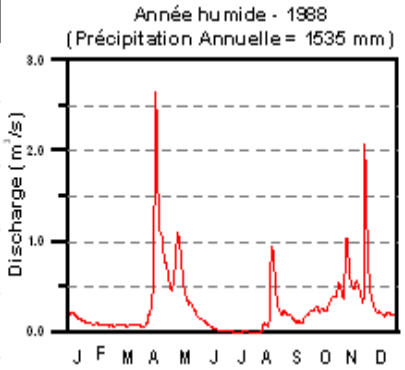
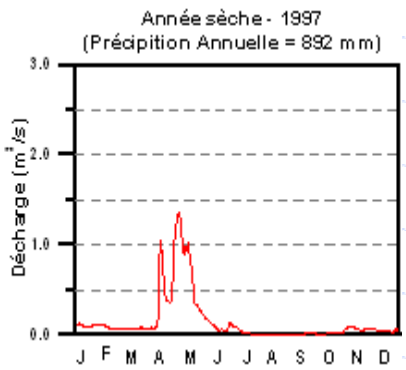
External contingencies for SNAM ?

- The local river is tiny (<< 1m3/s) and thus cannot "accept"
- … much quantities







- … chemicals concentrations and acidity
- … temperature discrepancies
- All factors fluctuating highly every hour !

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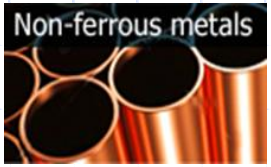
What are the internal key factors ?

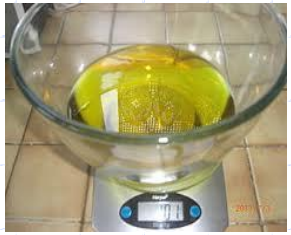
- SNAM processes many different metals and chemicals, which could be found in water

- **Nickel** from NiCad, NiMH batteries
- **Cadmium** from NiCad and wastes

- **Cobalt** from Li-io



- **Aluminum** and **Copper** from connectors and casings



- Chemicals from electrolytes (KOH, …)

What are the internal key factors ?

- SNAM uses water as a cooling agent for thermal process, within a closed circuit

- Usually no pollution, but :
- … huge quantity per hour
- … exiting at high temperature
- … without energy recovery

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What are the internal key factors ?

- SNAM uses water as the production agent for hydrometallurgical process,.

- Pollution must be prevented, with :
- … huge quantity per hour/batch
- … exiting at hot temperature
- … with metals inside like **Zinc** or **Nickel**, or emerging **Lithium**,

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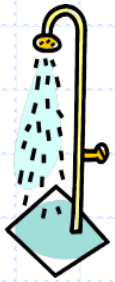
What are the internal key factors ?

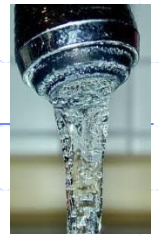
- SNAM uses much water also as a production factor :

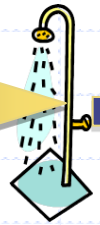
- **Clothes** and even carpets are to be washed

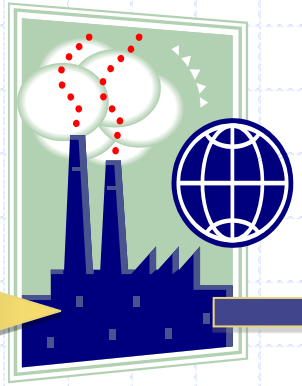


- Workers have to **shower** before going out

At the beginning were the dinosaurs



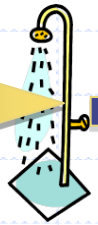


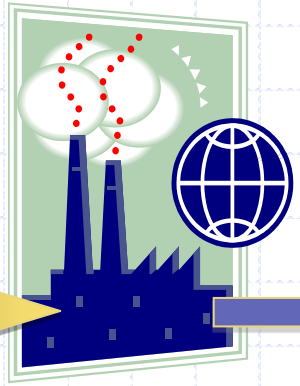
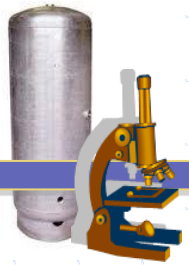


Then was the Antiquity





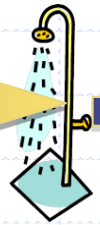



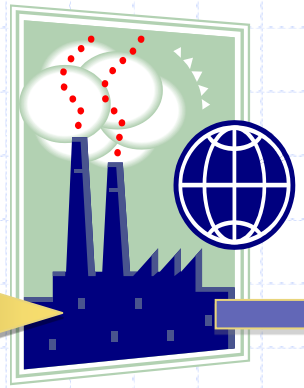




Then the Middle Age





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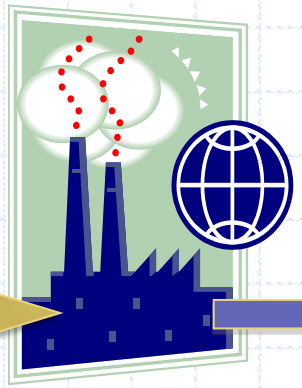
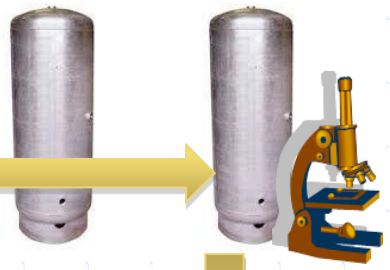
Here we are...









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Waste water treatment process

Water distillation unit

Monitoring unit

Laboratory, control & reporting

24/7dynamic control

Refrigerated sampling unit linked with volume

WATER CONTROL

Clothes & IPE decontamination unit

- Study
- Choice of chemicals
- Adaptation to textiles

Chemicals

- Industrial Capacity
- Aseptic
- Drying

- IPE Cleaning (masks)

Ultrasound

- Drying
- Packaging

Steam

- Unit started in September 2011
  - ✓ 1 ton / month, with extensive capacity
  - ✓ Partnerships with external companies (SNAM operating for other companies)
  - ✓ Zero waste water, reused inside the plant

Decontamination unit

Selection and trial of chemicals
Selection and test of tools

Room 1 : Entry

Room 2 : Exit

-First test in July 2011.
-Industrial production from end of 2011.

Closed loop within the plant

AIR /Glycol Cooling

Water consumption reduced (quantity divided by 3)

Zero waste = full compliance water directive 2015, 2020

2014

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Aerotherm unit

Before

After

Not forgetting rain and fire waters…

Rain water tank with fire water capacity : 24/7 monitoring with oil pollutants treatment

Oil treatment

Venturi

FIRST RESULTS

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Water emissions minimization & the Water framework Directive

Marlies Messiaen– IZA Environment

WFD (2000/60/EC)

- Aim: Art (1):

Protection of inland surface waters, transitioal, coastal and groundwater

- How:

✓ The WFD requires from the EC to establish EQS (= safe concentration) for Priority substances and Priority Hazardous Substances (PHS)

✓ At the moment 33 substances are on the list (including Cd)

✓ MS have to achieve a good chemical and ecological status of their inland waters (cfr EQS) (EQS Directive (2008/105/EC)

✓ MS have to make up RBMP

➔ RBMP in 2009 and good status by 2015…

WFD (2000/60/EC) and EQS Directive (2008/105/EC)

AA-EQS for inland surface waters (lakes and rivers) (µg Dissolved Cd/L)	AA-EQS other surface waters (marine, coastal waters) (µg Dissolved Cd/L)	MAC EQS (µg Dissolved Cd/L)
<=0.08 (H: <40 mg CaCO3/L)	0.2	<=0.45 (H: <40 mg CaCO3/L)
0.08 (H: 40 to < 50 mg CaCO3/L)		0.45 (H: 40 to < 50 mg CaCO3/L)
0.09 (H: 50 to < 100 mg CaCO3/L)		0.6 (H: 50 to < 100 mg CaCO3/L)
0.15 (H: 100 to 200 mg CaCO3/L)		0.9 (H: 100 to 200 mg CaCO3/L)
0.25 (H: >= 200 mg CaCO3/L		1.5 (H: >= 200 mg CaCO3/L

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WFD and EQS directive

- ✓ Priority substances: specific measures for the progressive reduction of discharges, emissions and losses
- ✓ PHS: the **cessation or phasing-out** of discharges, emissions and losses

➔ **Cd is considered as Priority Hazardous Substance**

➔ **Have to be achieved in 2020**

- ✓ The WFD and the EQS directive contain **no specific measures** on how MS have to achieve this.
- ✓ The WFD contains basic measures for the MS:

e.g.: Best avaiable technique, emission limit values, programmes of measures, emission registrations, pollutor pays principle...

The WFD contains no product related measures!

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HOW?

- EQS Directive (art 5.5:):

Commission shall verify by 2018 that the aims for the WFD are met, i.e. that emissions, discharges and lossess are making progress towards compliance with the reduction or cessation objectives.

HOWEVER:

- EQS Directive (point 10) refers to naturally occuring substances:

'MS should implement necessary measures with the aim of ceasing or phasing out emissions, discharges and losses. For substance occurring naturally or though natural processess, the cessation or phasing-out of emissions, discharges and losses from all potential sources is impossible'.

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HOW?

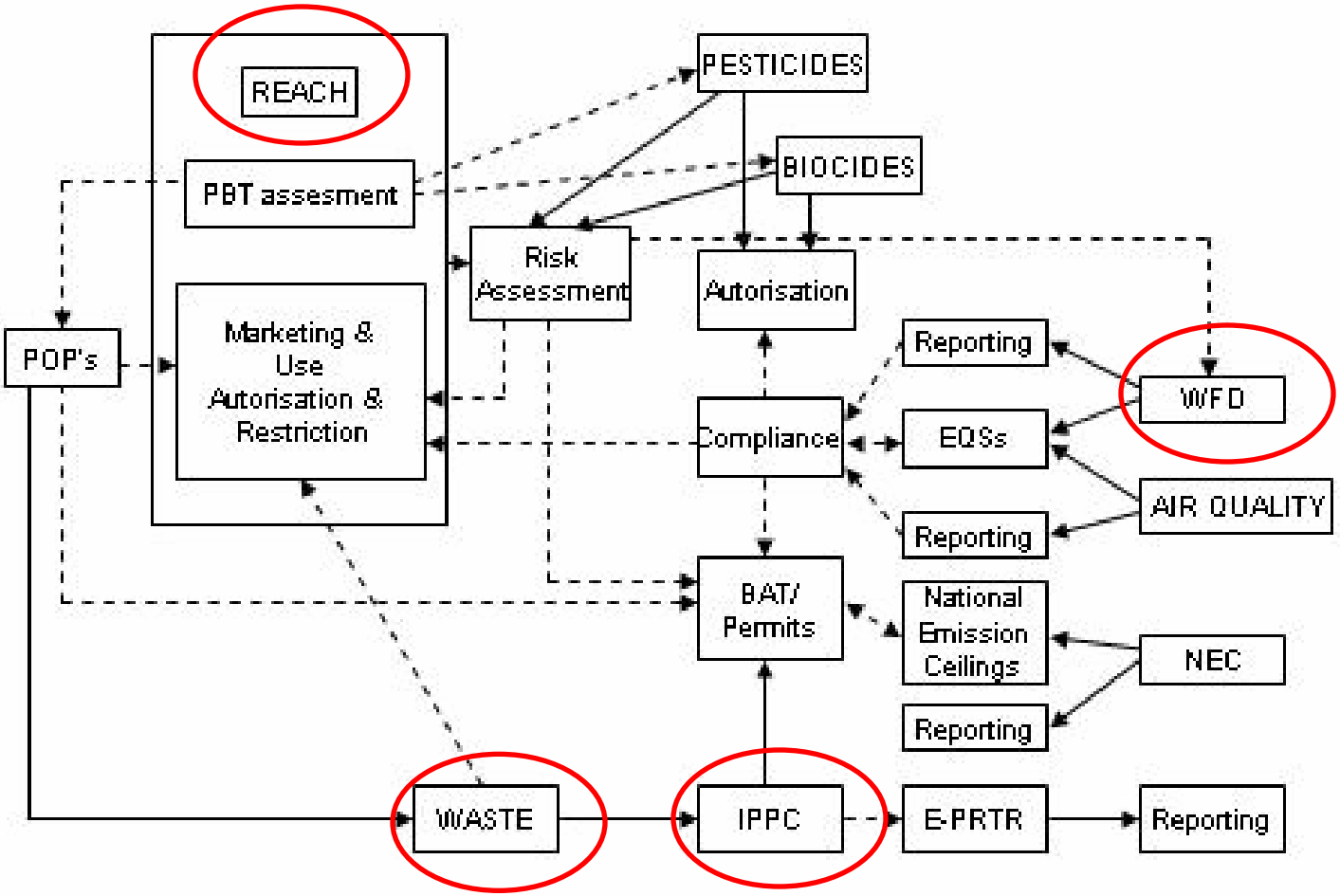
- **EQS directive:**
  - ✓ A time-table for cessation or phase-out can only be related to an inventory.
  - ✓ The quantification of losses of substances occuring naturally or resulting from natural processes, in which case comple cessation or phase-out from all potential sources is impossible. In order to meet those needs, each MS should establish an inventory of emissions, discharges ande losses for each river basin district or a part of a river basin district in its territory
  - ➔ How to inventory: RBMP (monitoring programmes) and E-PRTR...
  - ✓ Causes of pollution should be identified and emissions should be dealt with at source, in the most economically and environmentally effective way.

Other legislations

- MS should take into account any other relevant community legislation when formulating measures
- *EQS Directive*: As regards emissions controls of PS from point and diffuse sources it seems more cost-effective and proportionate for MS to include, where necessary, in addition to the implementation of other existing community legislation, appropriate control measures in the programme of measures to be developed for each river basin district.

➔ Most appropriate measures (other directives and regulations) to support the implementation of the required pollution reducting measures and to find out which is the most appropriate level to implement them...

Other legislations



Summary

- Cd is PHS
- By 2020: phasing-out and cessation of discharges
- WFD refers to basic measures, no product related measures
- MS have to make an inventory/time-table via monitoring programmes (WISE data), data from E-PRTR,…
- MS have to take into account other legislations (IPCC, REACH, Waste Directive,...)
- EQS Directive refers to naturally occuring elements!

➔ It's up to MS how to achieve "zero" discharges....

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OCdBIO -Occupational Cadmium Bio-monitoring Observatory

- Since 2008, data on Cd biomonitoring in the Cd industry is collected in order to convince ourselves and authorities on
  - ✓ the efficiency of our risk management program
  - ✓ the compliance of the current exposure levels with the OELs
- It is interesting for ICdA members to compare their own data with aggregated data from the whole Cd using industry
- A follow-up is interesting only if there is a long-term involvement of the companies (at least 3 years: 2008-2010)

Selected biomarkers of exposure

- Cadmium in blood – CdB: indicator of recent exposure
  - Cadmium in blood (µg/L)
- Cadmium in urine – CdU: biomarker of the amount of Cd stored in the body and in particular in the kidney cortex where the first signs of Cd toxicity develop
  - Cadmium in urine (µg/g creatinine)

EU-Sites concerned

EU-sites	Sollicited	Responded	Aggregated Blood / Urine
Nyrstar – Auby (F)	1	X	X/X
Nyrstar- Budel (Nl)	2	X	X/X
Nyrstar – Balen (B)	3	X	/X
Nyrstar – Overpelt (B)	4	X	/X
Xstrata- Nordenham (Ge)	5	X	X/X
Xstrata – San Juan (Sp)	6	X	X/X
Boliden- Odda (No)	7	X	X/X
Boliden – Kokkola (Fi)	8	X	X/X
KCM – Plovdiv (Bu)	9	X	X/
Porto-Vesme – (It)	10	X	X/X
Boleslav (Po)	11	-	--
Miasteczko (Po)	12	-	--
Silesia - Katowice (Po)	13	-	--
OCK- Kardjali (Bu)	14	-	--
Copsa-Mica (Ro)	15	-	--
Floridienne – Ath (Be)	16	X	X/X
Accurec - Wiehagen (Ge)	17	X	/X
SNAM - Viviez (F)	18	X	X/X
SAFT – Bordeaux (F)	19	X	X/X
SAFT – Nersac (F)	20	X	X/X
SAFT – Ferak (Cz)	21	X	/X
SAFT – Oskarshamm (S)	22	X	X/X
Hoppeke – Brillon (Ge)	23	X	/X
Gas/Enersys - Zwickau (Ge)	24	-	--
Rockwood - Kidsgrove (UK)	25	X	X/X
JMB – Fenton (UK)	26	X	X/X
5NPlus–Eisenhuttenstadt(Ge)	27	X	X/X
Fisrt Solar – Frankfurt Oder (Ge)	28	X	X/X
EDI – (F)	29	-	--

OCdBIO 4 – Analysis / trends

Prof. A. Bernard - UCL

Biomonitoring of occupational exposure to cadmium

Louvain Centre for Toxicology and applied Pharmacology
Catholic University of Louvain

Brussels, October 23, 2012

A. Chaumont & A. Bernard

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Distribution of urinary cadmium in EU-sites 2008 - 2009 - 2010 - 2011

Number of EU-sites included in the Cd biomonitoring:

- 15 EU-sites in 2008
- 16 EU-sites in 2009
- 21 EU-sites in 2010
- 21 EU-sites in 2011

Cd in urine (µg/g creatinine)	2008		2009		2010		2011	
	N	%	N	%	N	%	N	%
0.00 - 1.00	1204	65.6	1442	67.9	1599	67.5	1912	72.0
1.01 - 2.00	258	14.1	300	14.1	337	14.2	362	13.6
2.01- 3.00	113	6.2	135	6.4	146	6.2	118	4.4
3.01 - 5.00	118	6.4	127	6.0	118	5.0	129	4.9
5.01 - 7.00	56	3.1	50	2.4	59	2,5	46	1.7
7.01 - 10.00	40	2.2	38	1.8	60	2,5	42	1.6
>10	46	2.5	33	1.6	51	2,2	47	1.8
Total	1835	100	2125	100	2 370	100	2656	100

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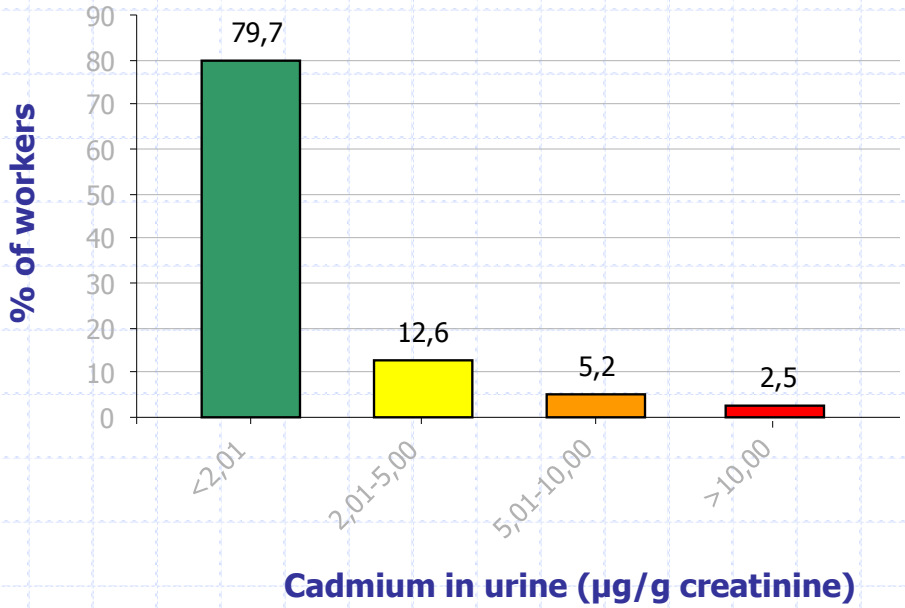
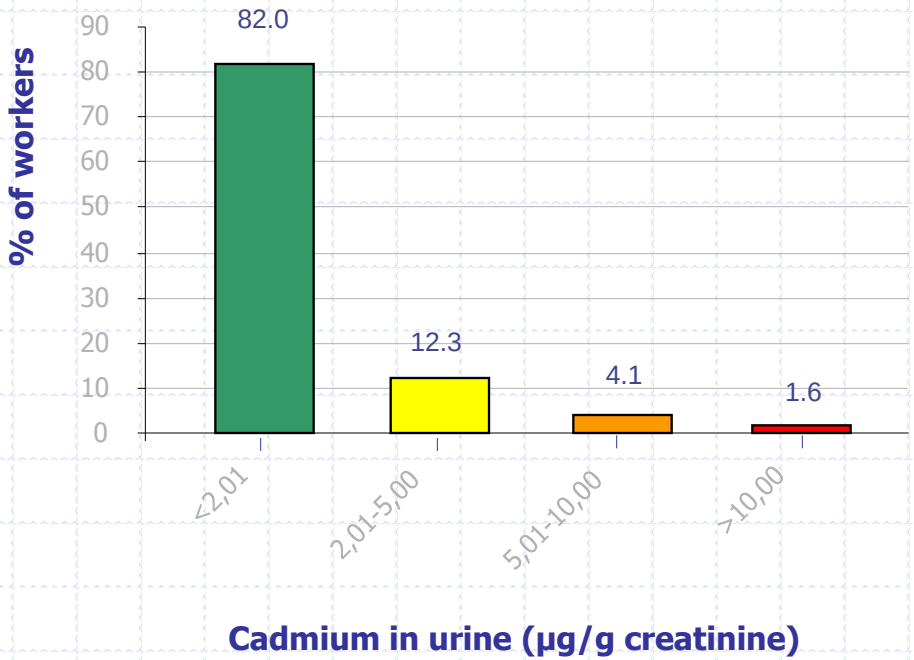
Distribution of urinary cadmium values in EU-sites 2008

Cd in urine (µg/g creatinine)	2008	
	N	%
0.00 - 1.00	1204	65.6
1.01 - 2.00	258	14.1
2.01- 3.00	113	6.2
3.01 - 5.00	118	6.4
5.01 - 7.00	56	3.1
7.01 - 10.00	40	2.2
>10	46	2.5
Total	1835	100



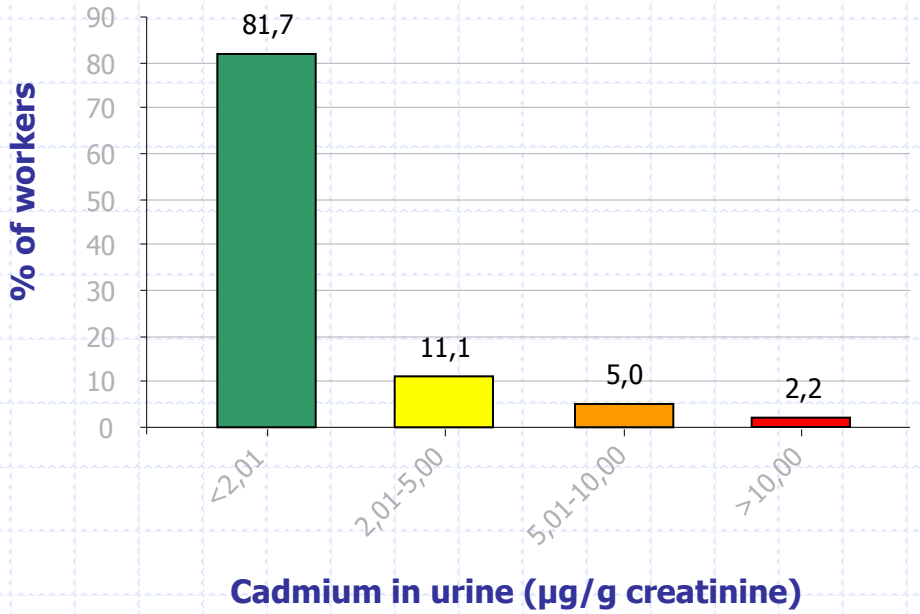
Distribution of urinary cadmium values in EU-sites 2009

Cd in urine (µg/g creatinine)	2009	
	N	%
0.00 - 1.00	1442	67.9
1.01 - 2.00	300	14.1
2.01- 3.00	135	6.4
3.01 - 5.00	127	6.0
5.01 - 7.00	50	2.4
7.01 - 10.00	38	1.8
>10	33	1.6
Total	2125	100



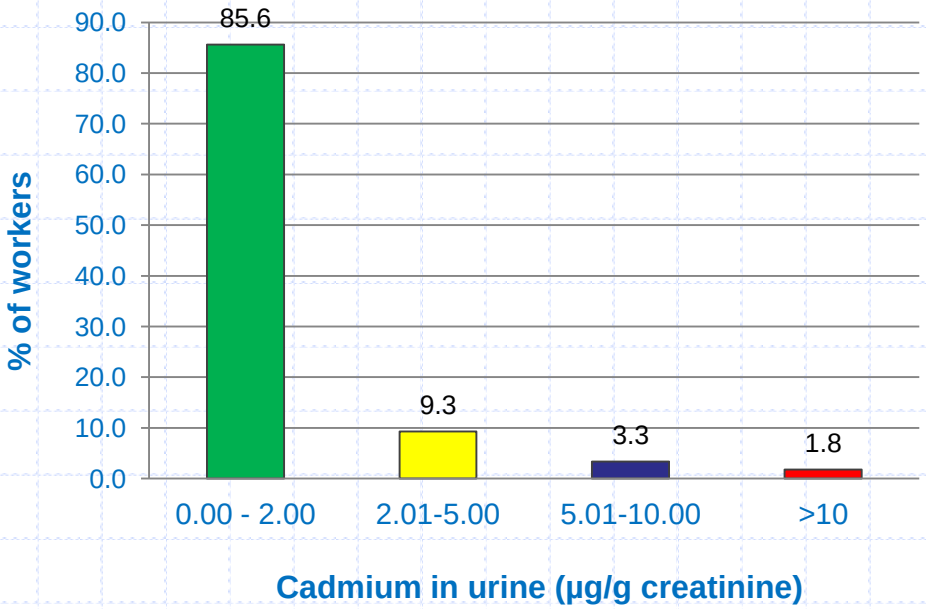
Distribution of urinary cadmium values in EU-sites 2010

Cd in urine (µg/g creatinine)	2010	
	N	%
0.00 - 1.00	1599	67.5
1.01 - 2.00	337	14.2
2.01- 3.00	146	6.2
3.01 - 5.00	118	5.0
5.01 - 7.00	59	2,5
7.01 - 10.00	60	2,5
>10	51	2,2
Total	2 370	100



Distribution of urinary cadmium values in EU-sites 2011

Cd in urine (µg/g creatinine)	2011	
	N	%
0.00 - 1.00	1912	72.0
1.01 - 2.00	362	13.6
2.01- 3.00	118	4.4
3.01 - 5.00	129	4.9
5.01 - 7.00	46	1.7
7.01 - 10.00	42	1.6
>10	47	1.8
Total	2 656	100



Distribution of blood cadmium in EU-sites 2008 - 2009 - 2010 - 2011

Number of EU-sites included in the Cd biomonitoring:

- 15 EU-sites in 2008
- 16 EU-sites in 2009
- 18 EU-sites in 2010
- 17 EU-sites in 2011

Cd in blood (µg/L)	2008		2009		2010		2011	
	N	%	N	%	N	%	N	%
0.00 - 2.00	1332	74.3	1332	73.0	1511	73.4	1831	76.0
2.01 - 3.00	177	9.9	195	10.7	232	11,3	259	10.8
3.01- 5.00	162	9.0	174	9.5	173	8,4	183	7.6
5.01 - 7.00	55	3.1	72	3.9	75	3.6	76	3.2
7.01 - 8.00	25	1.4	14	0.8	19	0,9	21	0.9
8.01 - 10.00	18	1.0	18	1.0	24	1,2	17	0.7
>10.01	24	1.3	20	1.1	25	1,2	22	0.9
Total	1793	100	1883	100	2059	100	2409	100

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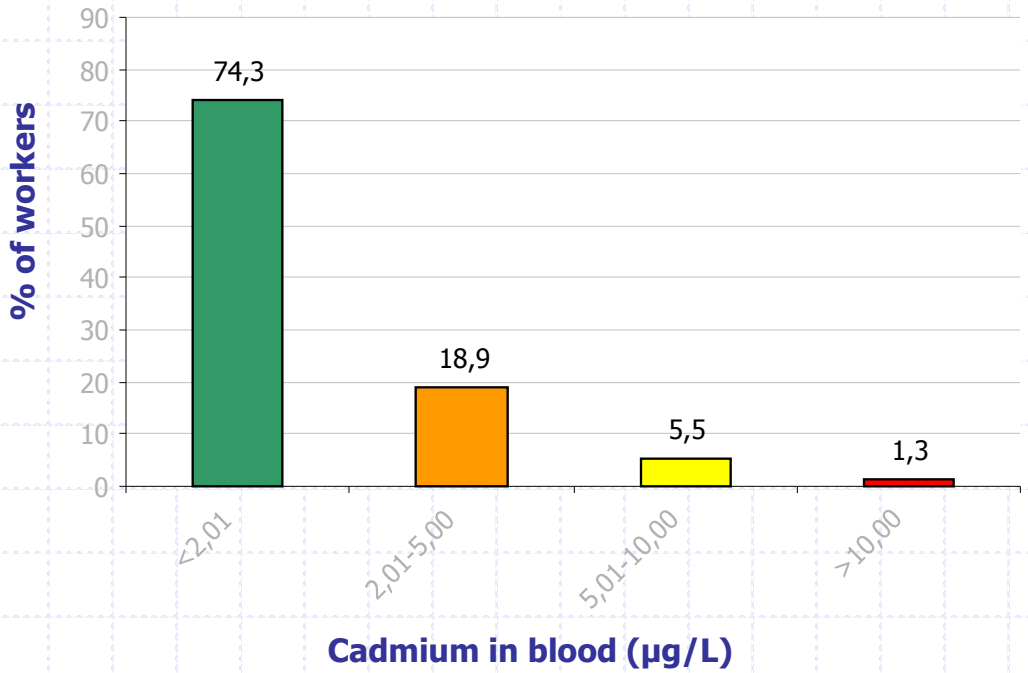
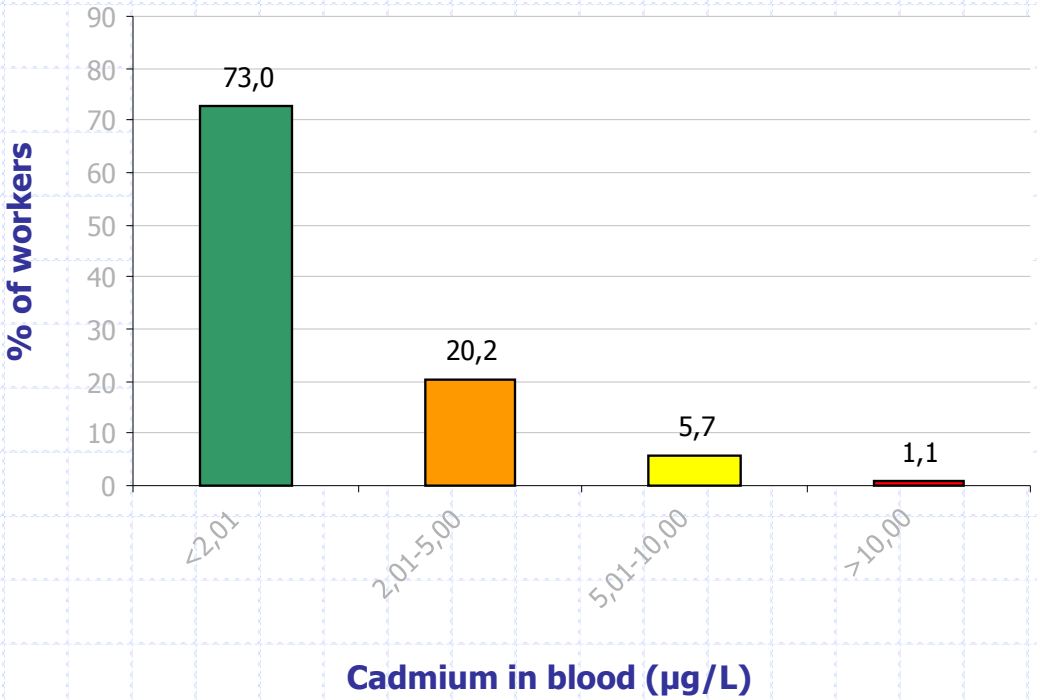
Distribution of blood cadmium in EU-sites 2008

Cd in blood (µg/L)	2008	
	N	%
0.00 - 2.00	1332	74.3
2.01 - 3.00	177	9.9
3.01- 5.00	162	9.0
5.01 - 7.00	55	3.1
7.01 - 8.00	25	1.4
8.01 - 10.00	18	1.0
>10.01	24	1.3
Total	1793	100



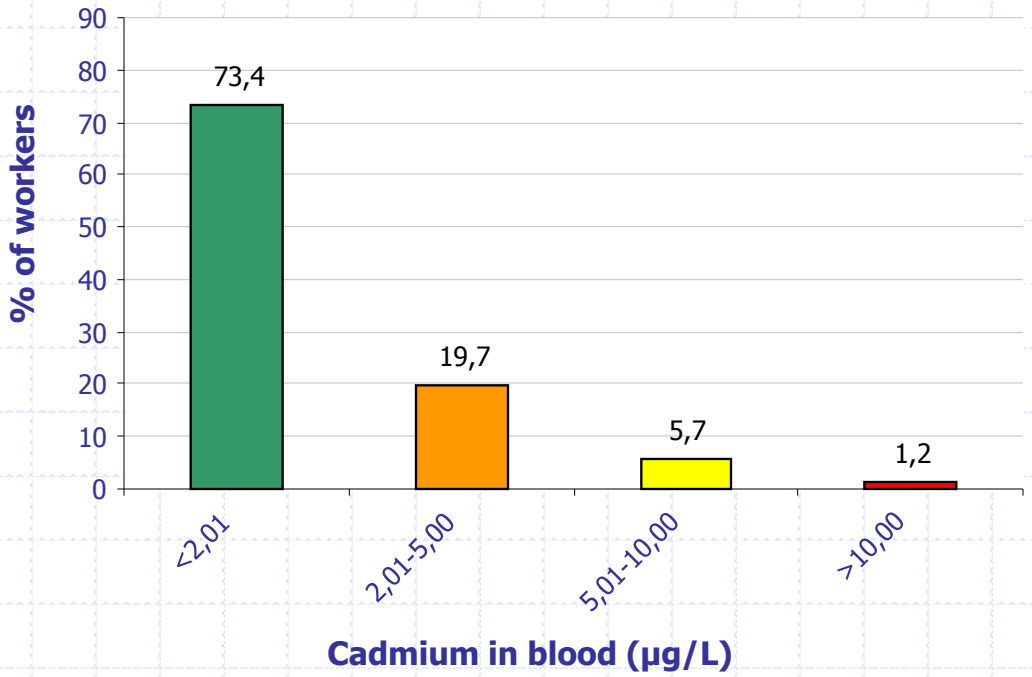
Distribution of blood cadmium in EU-sites 2009

Cd in blood (µg/L)	2009	
	N	%
0.00 - 2.00	1332	73.0
2.01 - 3.00	195	10.7
3.01- 5.00	174	9.5
5.01 - 7.00	72	3.9
7.01 - 8.00	14	0.8
8.01 - 10.00	18	1.0
>10.01	20	1.1
Total	1883	100



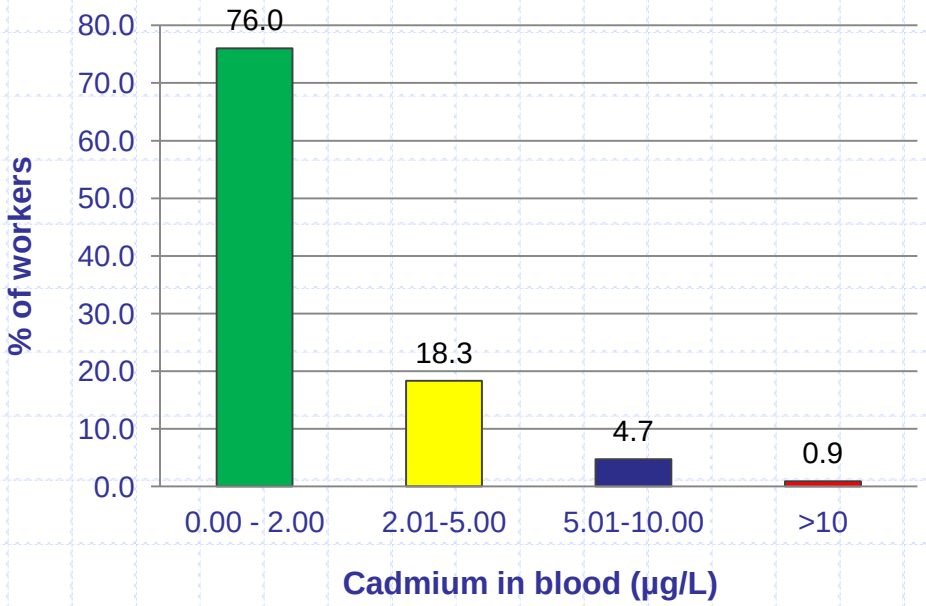
Distribution of blood cadmium in EU-sites 2010

Cd in blood (µg/L)	2010	
	N	%
0.00 - 2.00	1511	73.4
2.01 - 3.00	232	11,3
3.01- 5.00	173	8,4
5.01 - 7.00	75	3.6
7.01 - 8.00	19	0,9
8.01 - 10.00	24	1,2
>10.01	25	1,2
Total	2059	100



Distribution of blood cadmium in EU-sites in 2011

Cd in blood (µg/L)	2011	
	N	%
0.00 - 2.00	1831	76.0
2.01 - 3.00	259	10.8
3.01- 5.00	183	7.6
5.01 - 7.00	76	3.2
7.01 - 8.00	21	0.9
8.01 - 10.00	17	0.7
>10.01	22	0.9
Total	2409	100

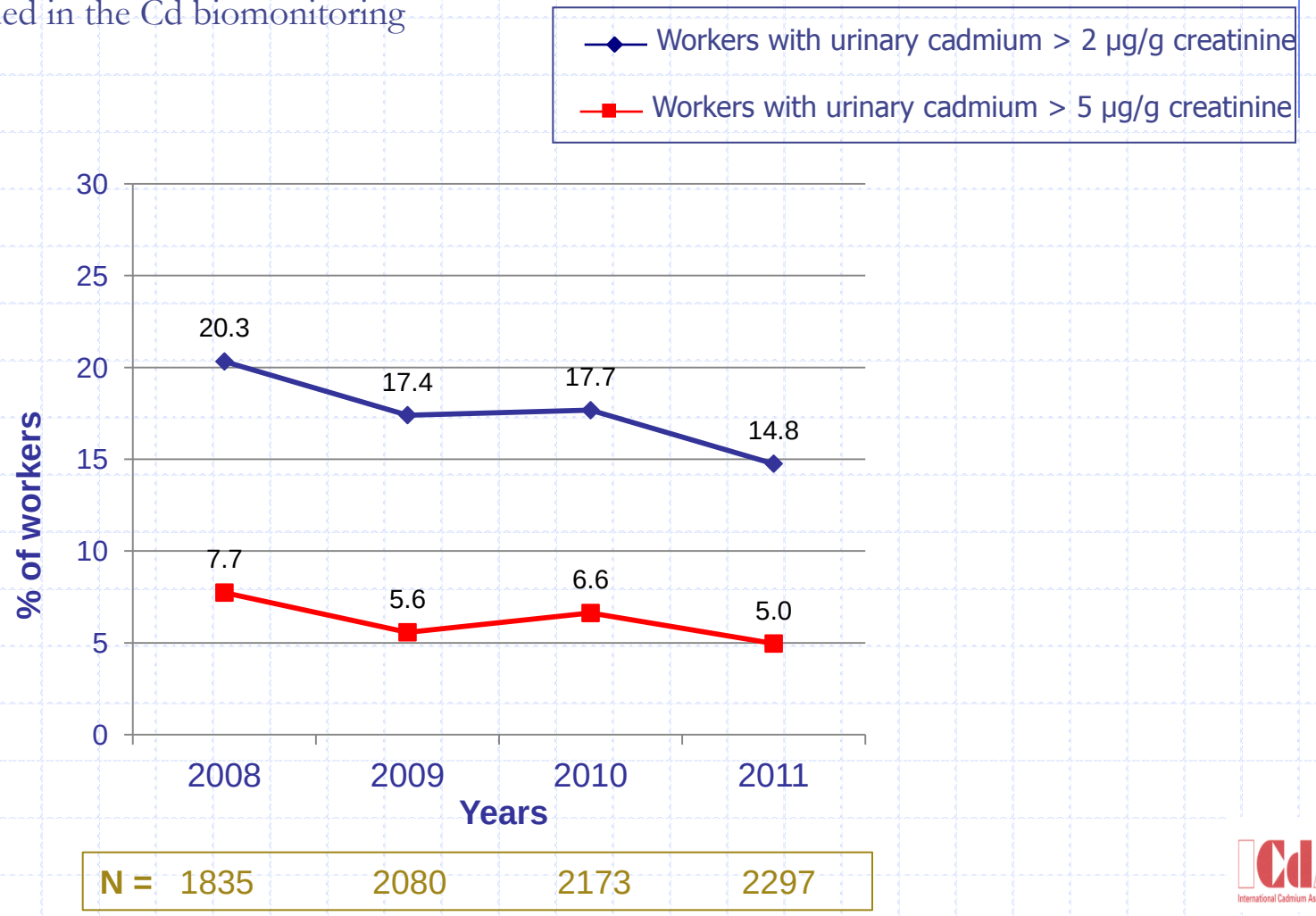


TIME TREND - 15 SITES

International Cadmium Association

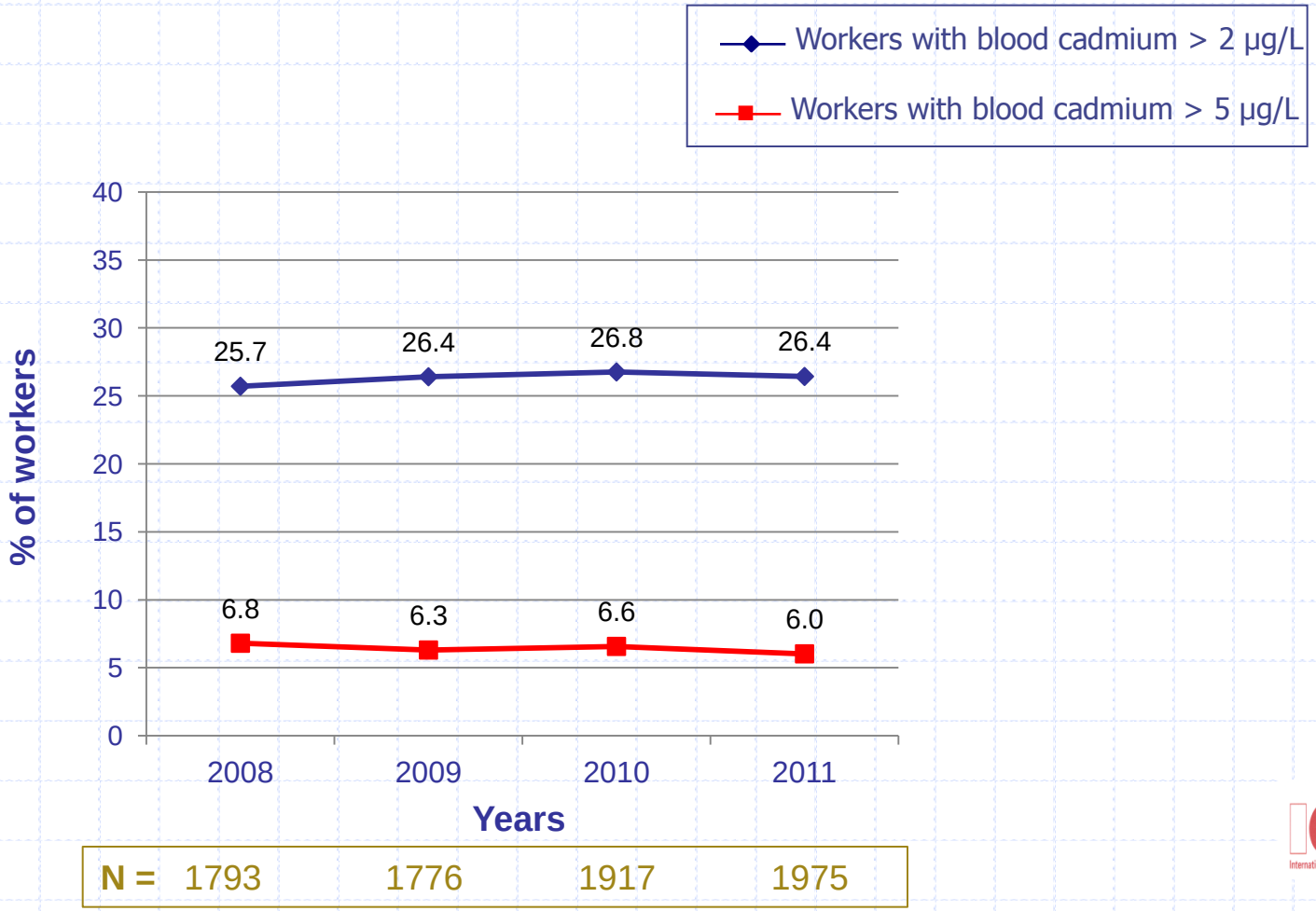
Percentage of workers exceeding an urinary cadmium levels of 2 or 5 µg/g creatinine

15 EU-sites included in the Cd biomonitoring



Percentage of workers exceeding a blood cadmium levels of 2 or 5 µg/L

15 EU-sites included in the Cd biomonitoring



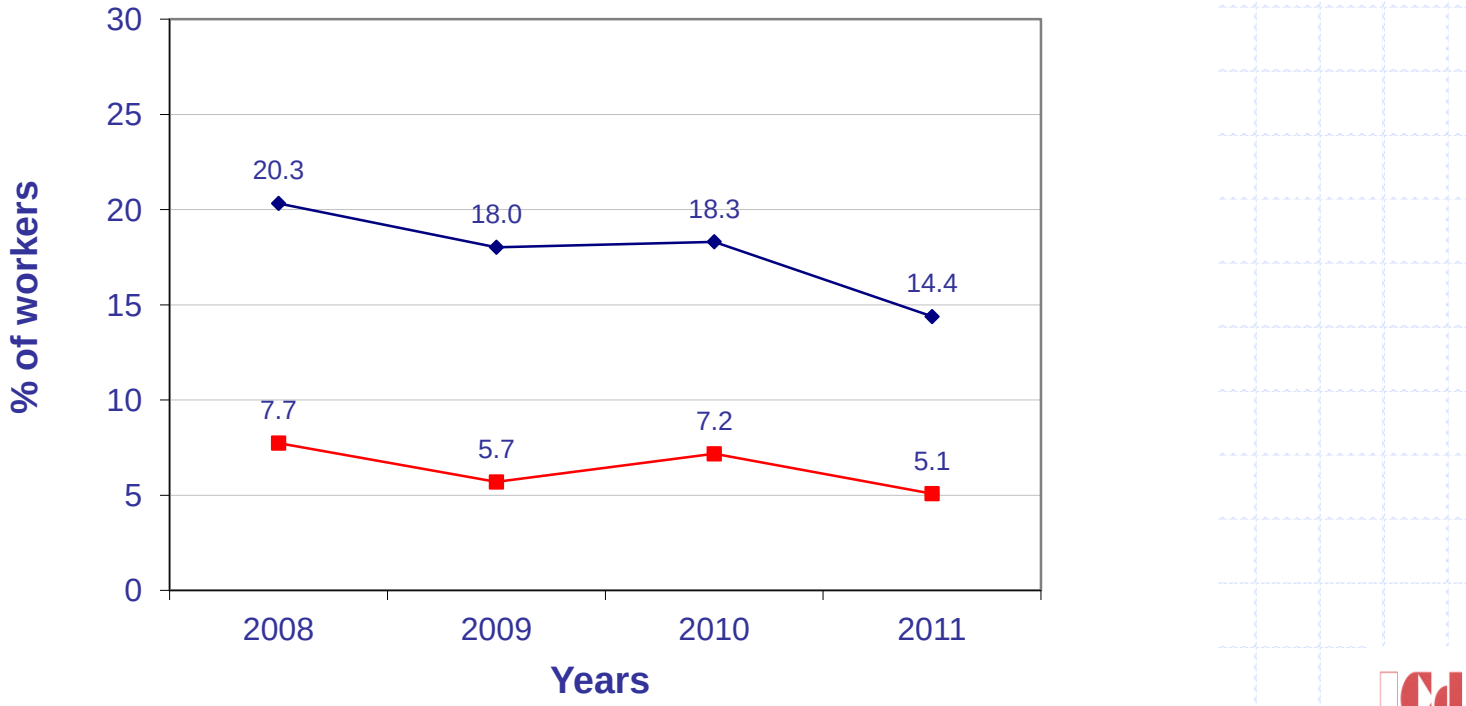
TIME TREND - ALL SITES

International Cadmium Association

Percentage of workers exceeding an urinary cadmium levels of 2 or 5 µg/g creatinine

Various numbers of EU-sites included in the Cd biomonitoring

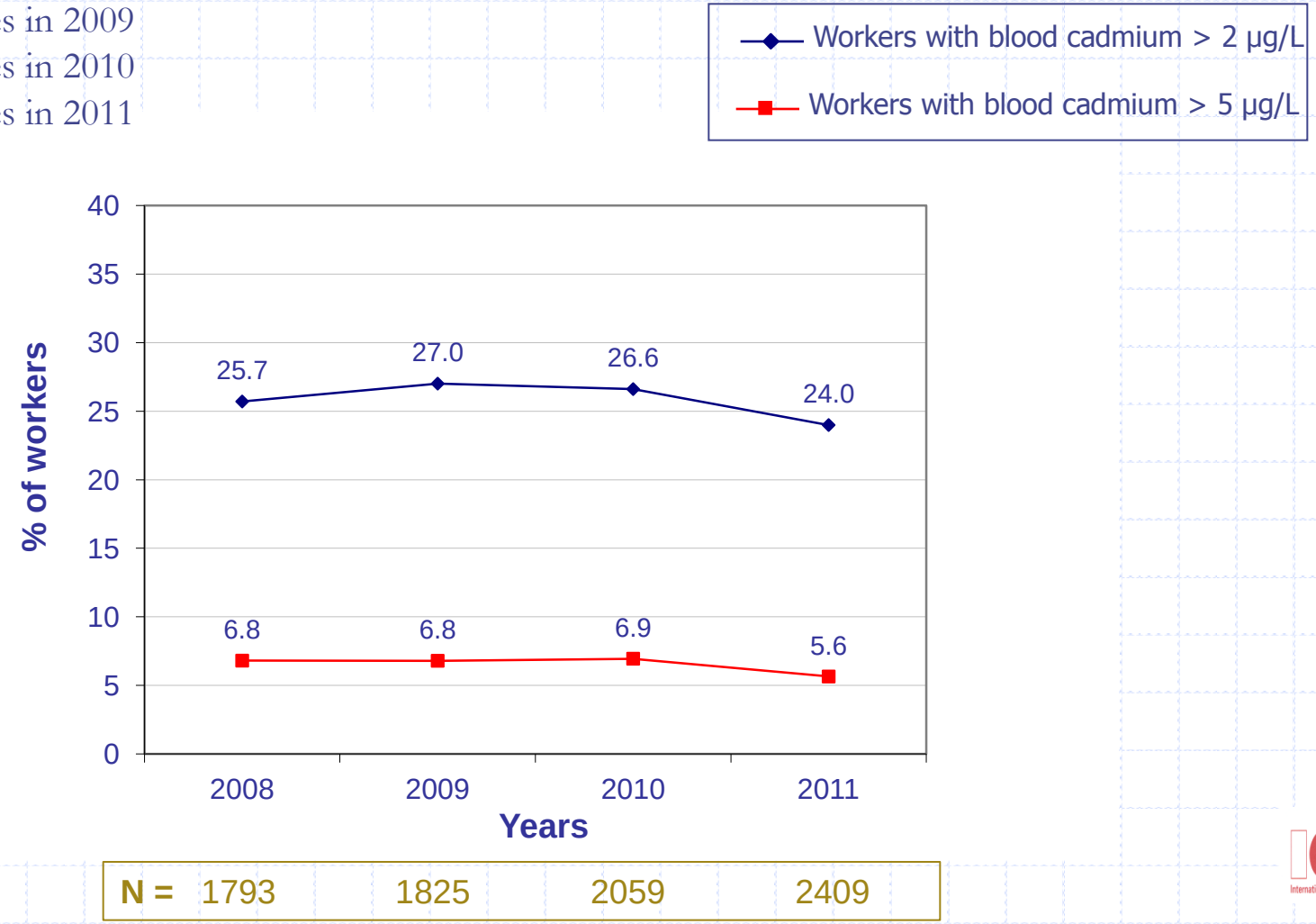
- 15 EU-sites in 2008
- 16 EU-sites in 2009
- 21 EU-sites in 2010
- 21 EU-sites in 2011



Percentage of workers exceeding a blood cadmium levels of 2 or 5 µg/L

Various numbers of EU-sites included in the Cd biomonitoring:

- 15 EU-sites in 2008
- 16 EU-sites in 2009
- 18 EU-sites in 2010
- 17 EU-sites in 2011



Limitations

. Follow-up is based on a cohort the size of which varies with time. Time trend can be affected by the employee turnover.

. No demographic data (age, gender)

. No data about smoking status and changes of smoking habits with thime.

Conclusions

1. No significant time trend for CdB. A tendency to lower CdB levels appears in 2011 when considering all sites but this might be due to a change in cohort size.

Conclusions

2. Confirmation of a decreasing trend over time in the prevalences of elevated CdU values (>2 μg/g cr and >5 μg/g cr.)

Conclusions / Next meetings