



SOLUTIONS TO RESPIRATORY HAZARDS IN THE WORKPLACE

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WOOD DUST EXPOSURES IN JOINERY WORKERS: AN INTERVENTION STUDY



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- DoL/ACC

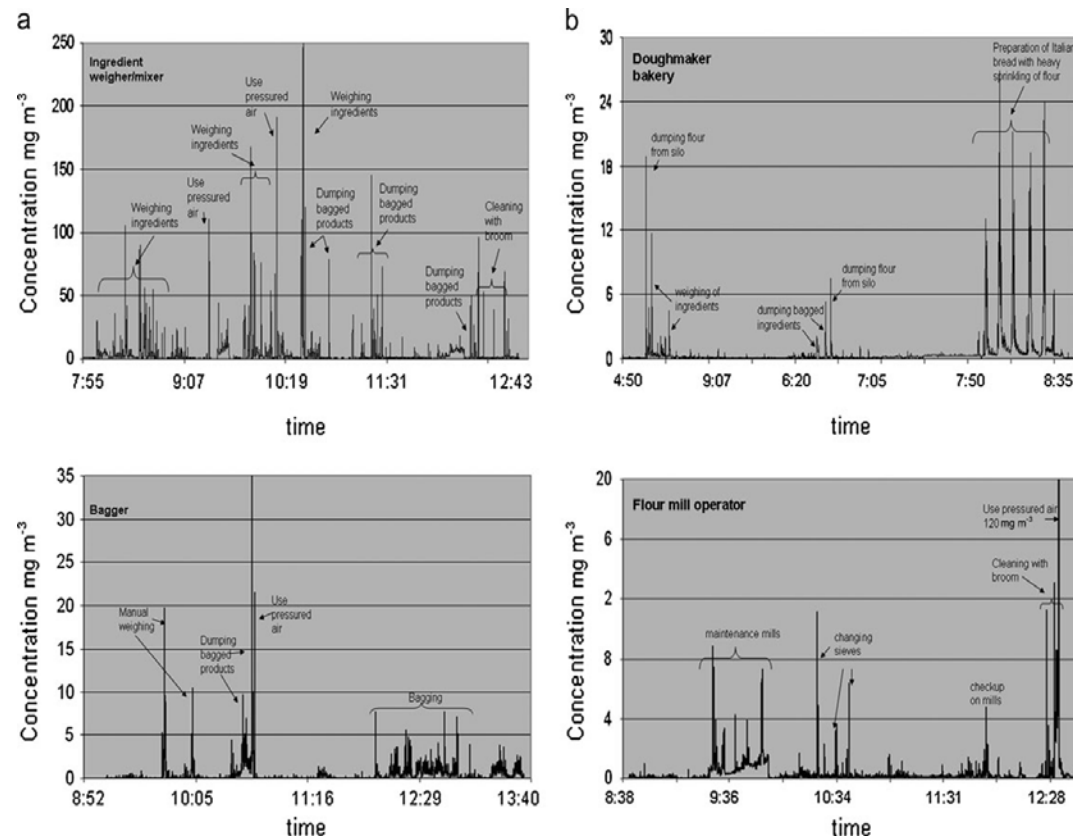
BACKGROUND: 8HR TWA AVERAGE EXPOSURES

	Inhalable Dust (mg/m ³)	Respirable Dust (mg/m ³)	Formaldehyde (ppm)
Joineries (150 workers)	2.48	0.27	0.014
Furniture Makers (116 workers)	1.22	0.12	0.012
All Workers (266 workers)	1.82	0.18	0.013

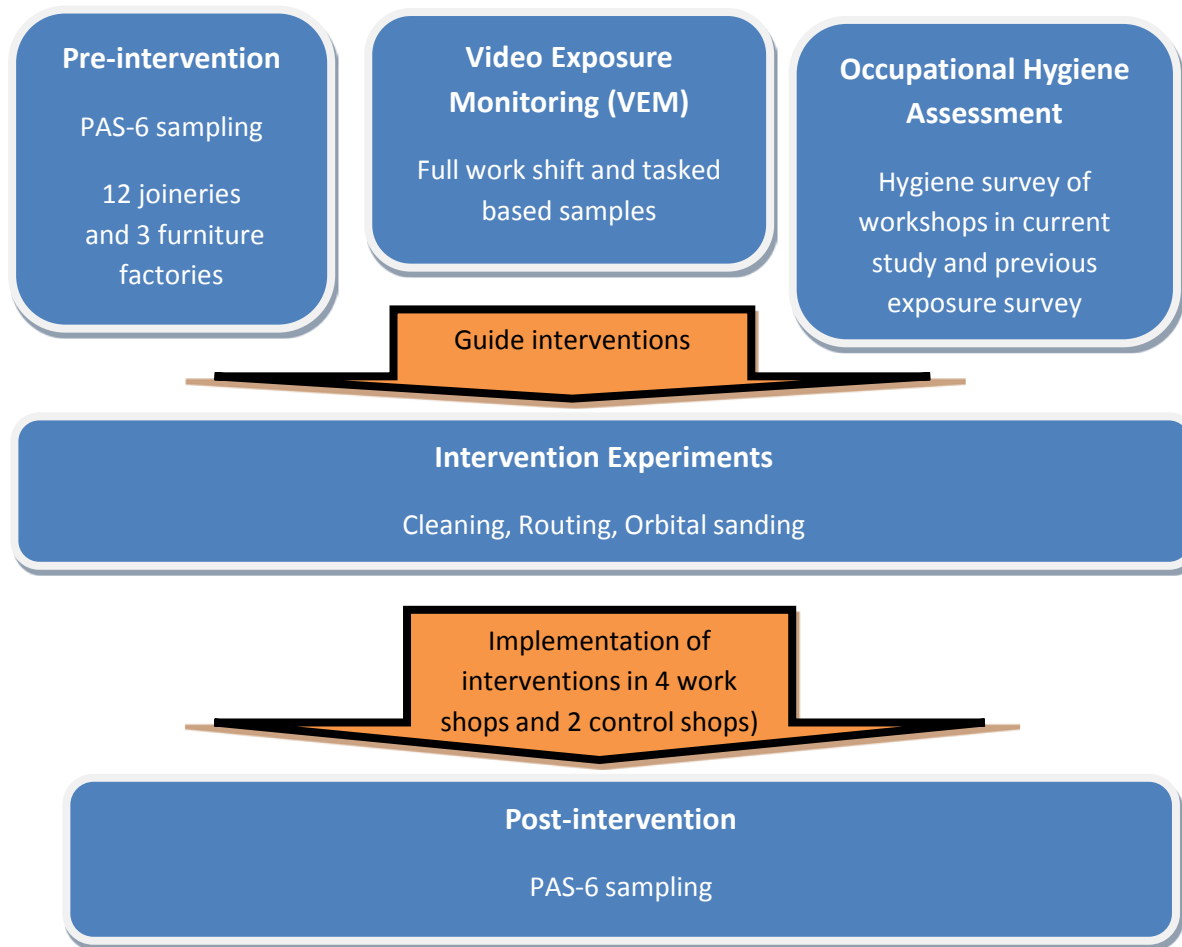
- Workplace exposure standard was 5 mg/m³.
- ACGIH standard - 1 mg/m³.
- From Dec 2010, WES lowered to 2 mg/m³.
- >76% of all workers were exposed to levels exceeding 1 mg/m³
- Intervention studies to reduce dust exposures are needed

EFFECTIVE CONTROL MEASURES NEED TO BE BASED ON A THOROUGH UNDERSTANDING OF (PEAK) EXPOSURES

- Educational interventions result in only modest reductions in exposure
- Task-based interventions targeting peak exposures can lead to reductions of more than 50% (Meijsters et al., 2008)
- 8-hour TWA exposures provide little insight in peak exposures and have limited usability in identifying optimal control strategies (Meijsters et al., 2008)
- Real time measurements are better suited for that



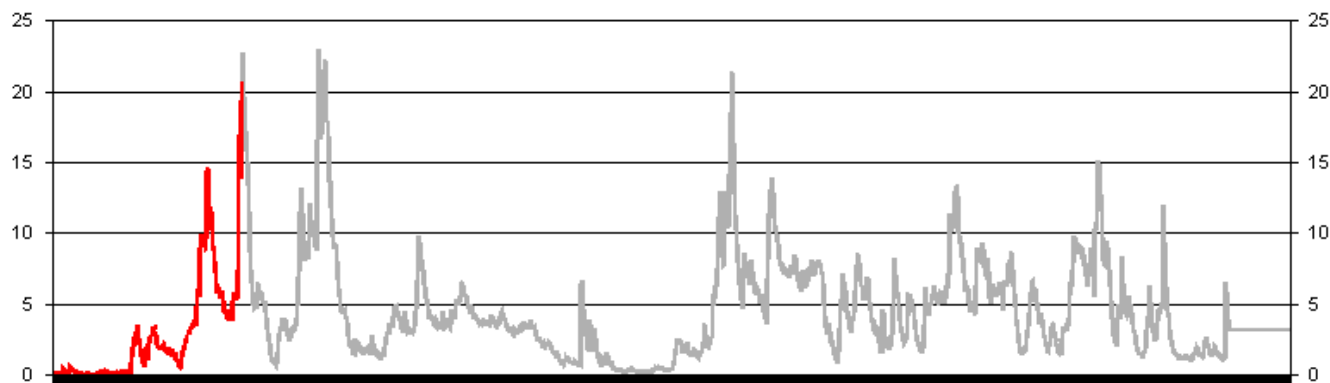
INTERVENTION STUDY IN THE JOINERY AND FURNITURE MAKING INDUSTRY



IDENTIFYING PEAK EXPOSURES IN JOINERY AND FURNITURE WORKERS USING VIDEO EXPOSURE MONITORING

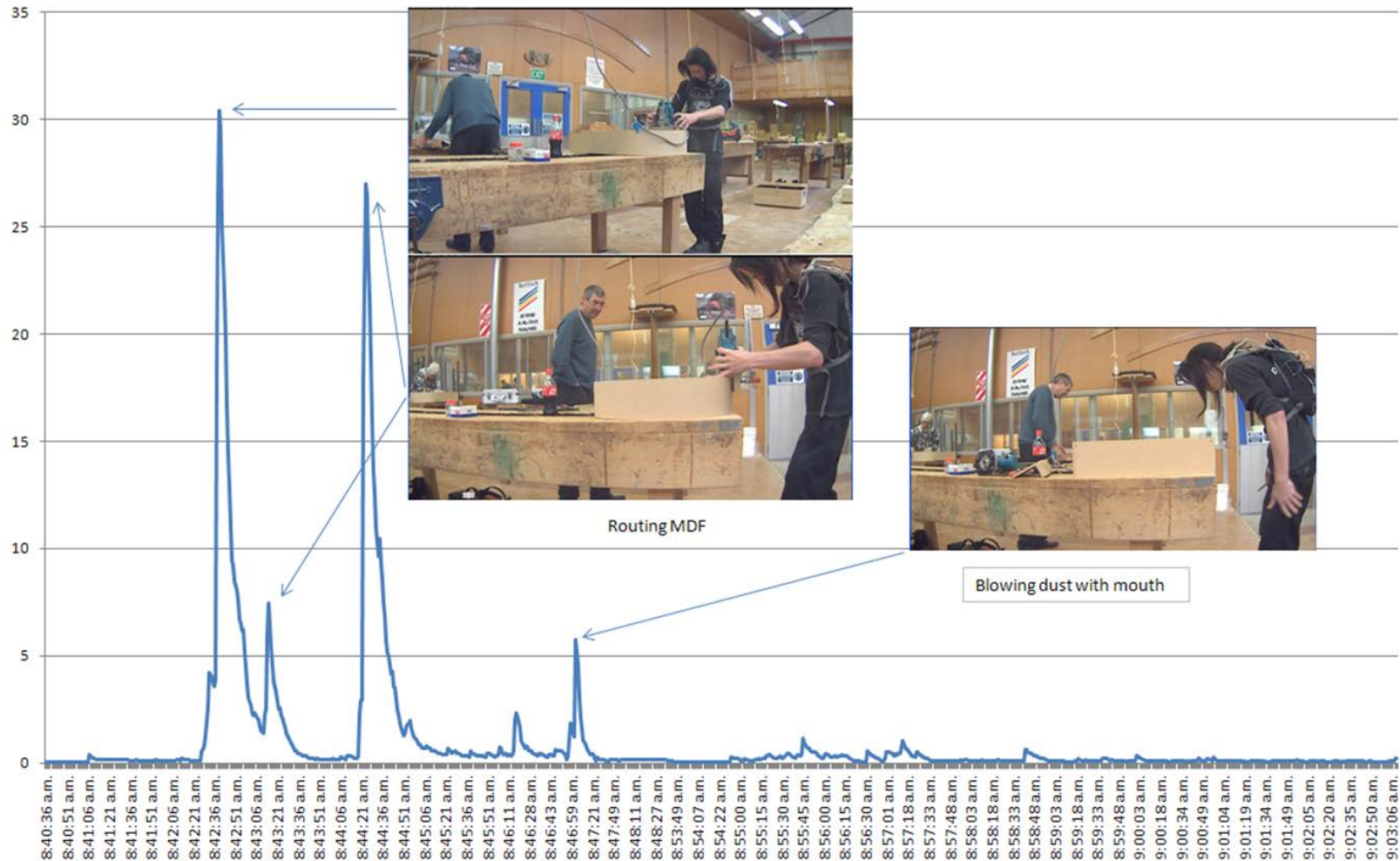


Sample time	Reading
3:07:16 p.m.	4.42
3:07:17 p.m.	4.24
3:07:18 p.m.	4.3
3:07:19 p.m.	4.02
3:07:20 p.m.	3.78
3:07:21 p.m.	4.05
3:07:22 p.m.	4.3
3:07:23 p.m.	4.2
3:07:24 p.m.	3.75
3:07:25 p.m.	3.96
3:07:26 p.m.	3.78
3:07:27 p.m.	4.02
3:07:28 p.m.	5.18
3:07:29 p.m.	5.82
3:07:30 p.m.	5.73
3:07:31 p.m.	5.61
3:07:32 p.m.	5.4
3:07:33 p.m.	5.73
3:07:34 p.m.	5.4
3:07:35 p.m.	5.28
3:07:36 p.m.	6.1
3:07:37 p.m.	7.44
3:07:38 p.m.	16.99
3:07:39 p.m.	15.32
3:07:40 p.m.	13.76
3:07:41 p.m.	14.61
3:07:42 p.m.	19.4
3:07:43 p.m.	20.51
3:07:44 p.m.	21.23
3:07:45 p.m.	22.73
3:07:46 p.m.	19.74
3:07:47 p.m.	17.79
3:07:49 p.m.	16.96
3:07:50 p.m.	17.26

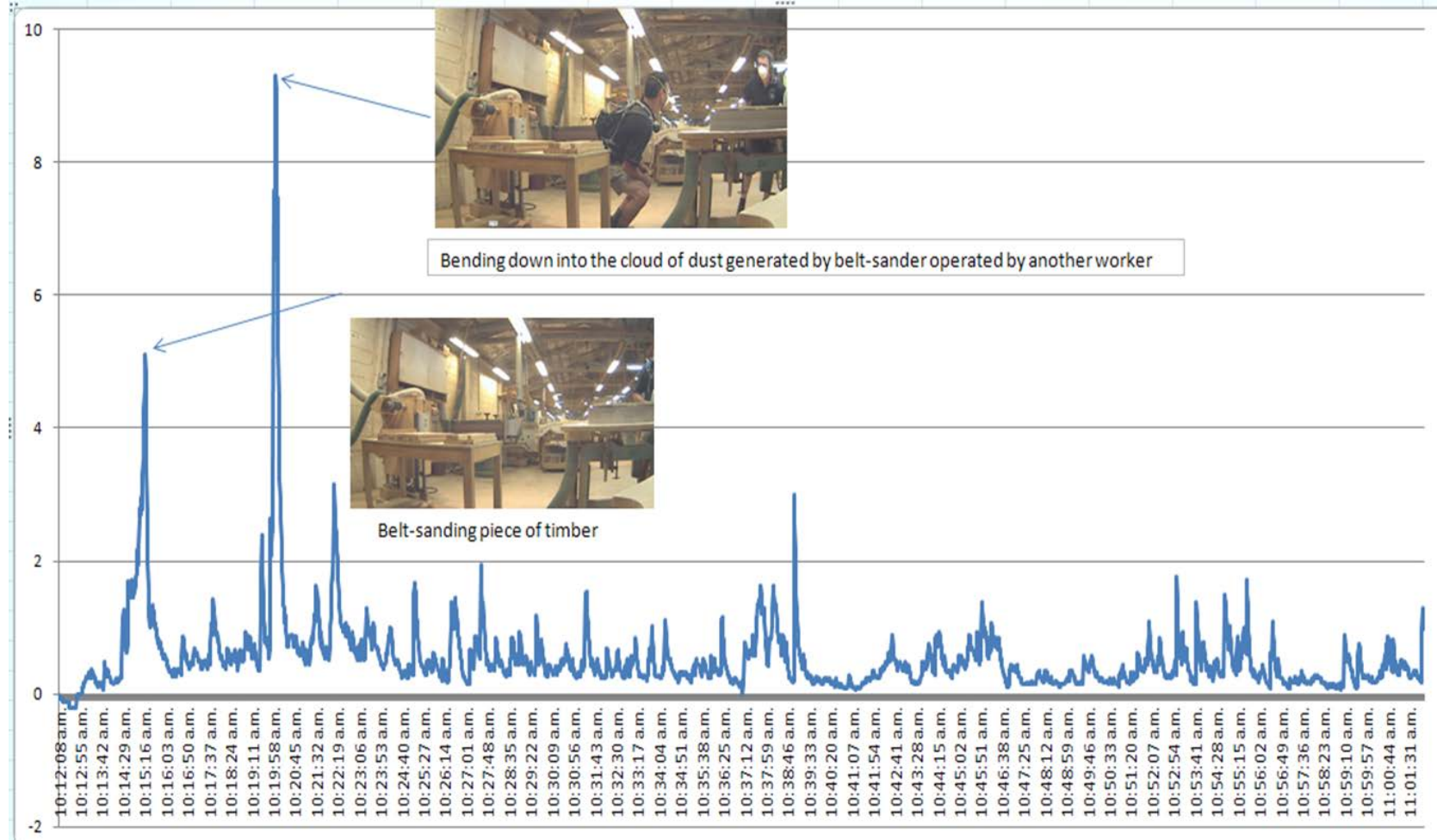


Video Exposure Monitoring
Centre for Public Health Research
Massey University
Wellington

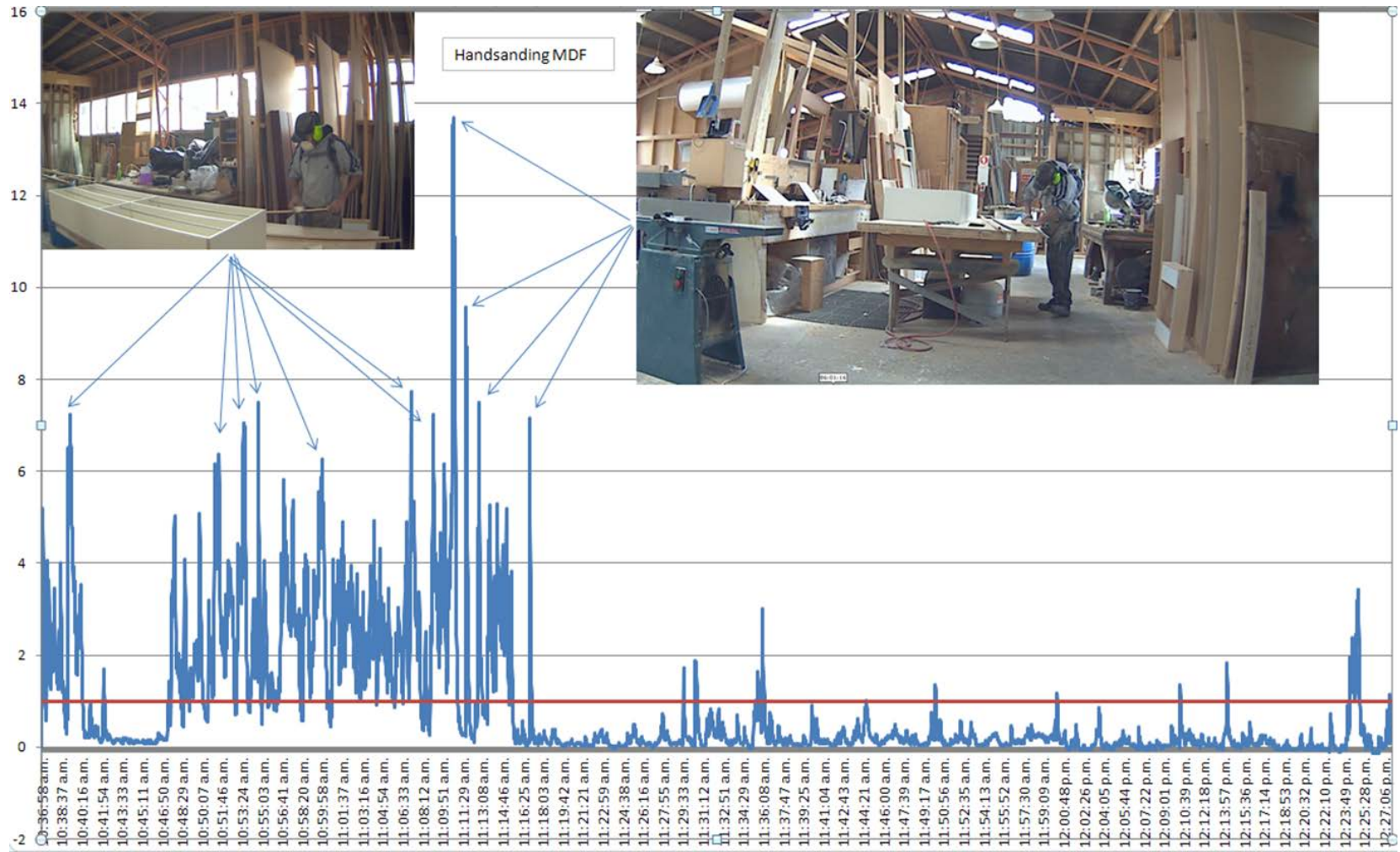
SOME EXAMPLES: ROUTING MDF, BLOWING DUST WITH MOUTH



SOME EXAMPLES: BELT-SANDING TIMBER, AND EXPOSED TO WOOD DUST GENERATED BY CO-WORKER



SOME EXAMPLES: SANDING MDF



TIME SPENT ON TASKS

- Use of hand tools: ~15%

Tasks and activities	% time allocated to each task	
	Joiners	Furniture makers
Assembly	21.5%	14.8%
CNC	12.1%	73.6%
Cleaning	0.7%	1.9%
Edge banding	1.2%	2.9%
Miscellaneous	27.3%	5.9%
Mortissing	0.5%	
Planing (electric hand-held)	0.4%	
Routing	6.5%	0.7%
Sanding (hand)	5.3%	0.0%
Sanding (hand-held orbital)	1.4%	
Sanding (machine belt sander)	9.0%	
Sawing (band saw)	1.2%	
Sawing (mitre saw)	0.6%	
Sawing (rip saw - for timber)	0.1%	
Sawing (table saw/circular saw)	4.2%	0.1%
Sawing (traditional hand)	0.2%	
Spindle moulding (table mounted router)	4.6	
Tenoning	1.1%	
Total	100%	100%

EXPOSURE DETERMINANTS

- Explained variance: 45% i.e. 55% of exposure variance was unexplained
- Secondary exposures
- Poor house keeping

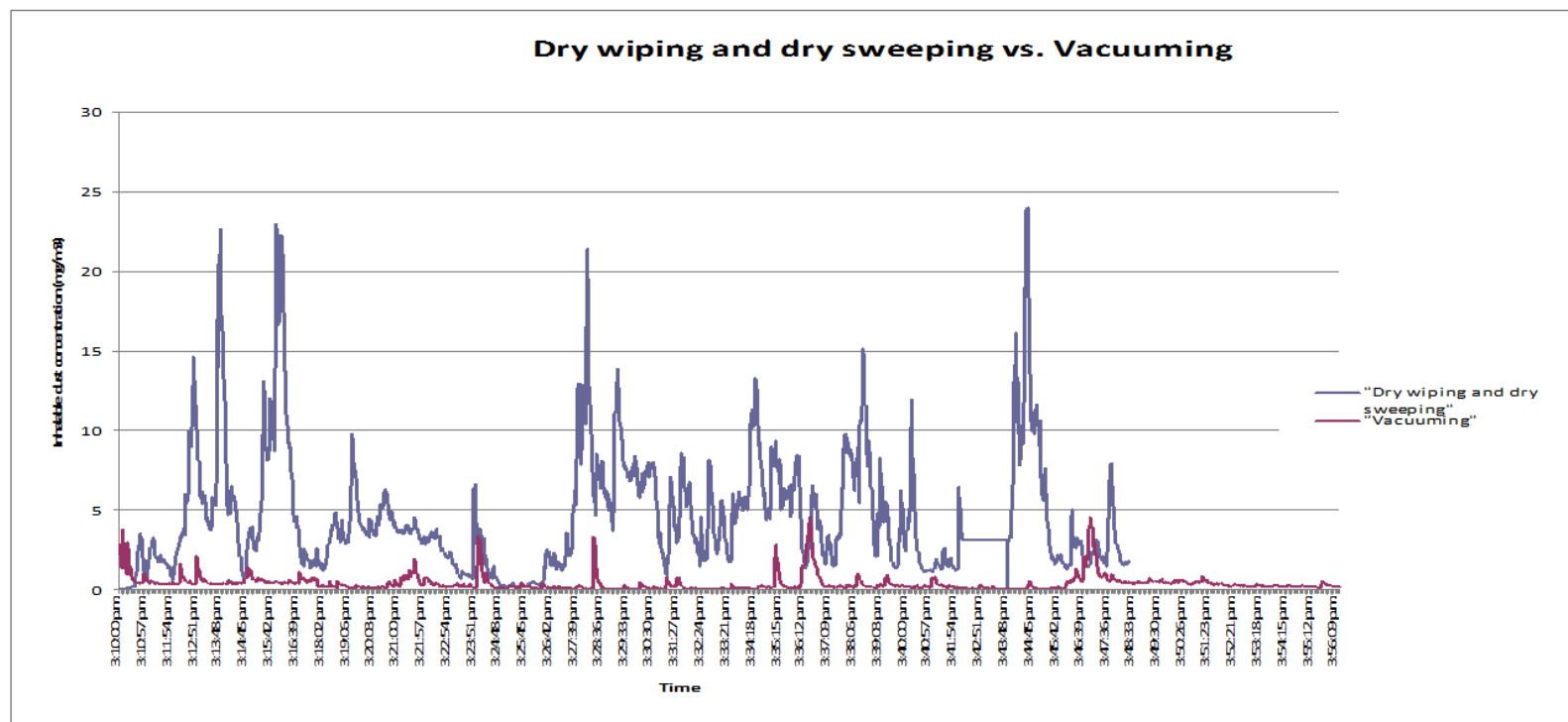
Determinants	Exposure ratios (95% CL)	
	Joiners ¹	Furniture makers ²
<u>Tasks/activities</u>		
Miscellaneous	2.1 (1.9-2.2)	4.0 (3.5-4.5)
Cleaning	8.4 (7.7-9.2)	5.0 (4.4-5.7)
CNC	2.6 (2.4-2.9)	1.7 (1.6-1.8)
Biscuit cutting	3.2 (2.9-3.5)	-
Tenoning	8.6 (7.9-9.3)	-
Mortissing	2.7 (2.4-2.9)	-
Routing	3.5 (3.3-3.8)	1.2 (1.2-1.3)
Spindle moulder	2.6 (2.4-2.9)	-
Sanding (hand)	6.0 (5.6-6.4)	1.6 (1.1-2.3)
Sanding (hand-held orbital)	11.1 (10.3-12.0)	-
Sanding (machine belt sander)	6.0 (5.5-6.4)	-
Edge banding	1.5 (1.4-1.6)	1.5 (1.5-1.5)
Buzzing	1.0 (0.8-1.1)	-
Thicknessing	2.1 (1.9-2.3)	-
Planing (traditional)	2.2 (2.1-2.4)	-
Planing (electric hand-held)	23.9 (22.1-25.9)	-
Sawing (band saw)	4.6 (4.2-5.0)	-
Sawing (mitre saw)	2.7 (2.5-3.0)	-
Sawing (rip saw)	1.0 (0.8-1.3)	-
Sawing (hand saw)	8.8 (5.9-7.8)	-
Sawing (circular saw)	2.4 (2.3-2.6)	6.8 (6.0 – 7.8)
Assembly	2.6 (2.4-2.8)	Reference
Gluing	Reference	

COST EFFECTIVE INTERVENTIONS

- Cleaning intervention
 - Vacuuming versus dry wiping and sweeping
- Using hand power tools
 - Downdraft table
 - Vacuum extraction attached to hand power tool
 - Extraction bag attached to hand power tool



CLEANING INTERVENTION EXPERIMENT RESULTS

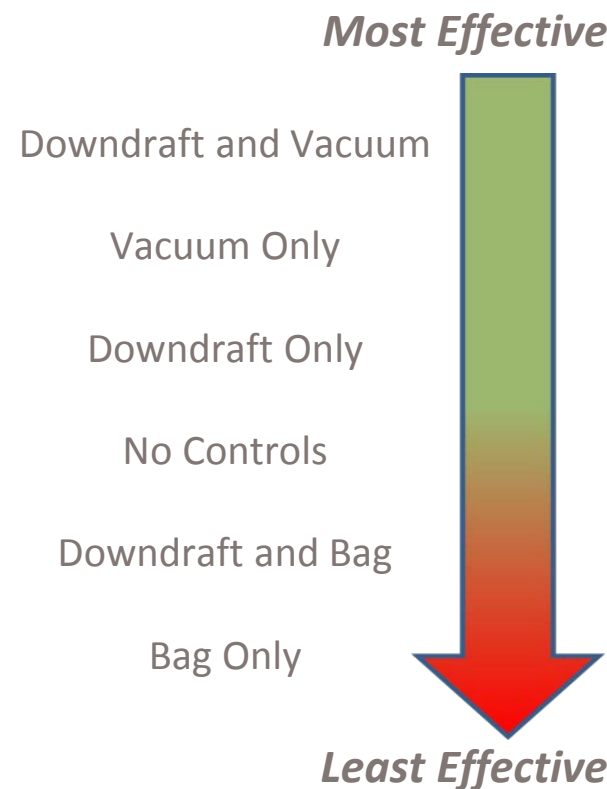


Main activities	Total sampling time	Min	Max	Avg
Dry wiping and dry sweeping with broom	37 min 10 sec	0	24.01	3.56
Vacuum cleaning	44 min 57 sec	0	4.57	0.35

HAND TOOL INTERVENTION EXPERIMENT: SANDING

	Emission (mg/m ³)		
Controls	N	GM (GSD)	% difference (95% CL)
No Controls	6	0.8 (1.2)	-
Downdraft Table	6	0.8 (1.2)	-8.3 (-46.2; 56.5)
Vacuum	7	0.2 (1.2)	-75.0 (-85.1; -58.2)***
Bag	6	1.5 (1.2)	73.6 (-0.9; 204.0)#
Downdraft + Vac	6	0.1 (1.2)	-83.5 (-90.3; -71.9)***
Downdraft + Bag	6	0.8 (1.2)	-3.3 (-44.9; 69.2)

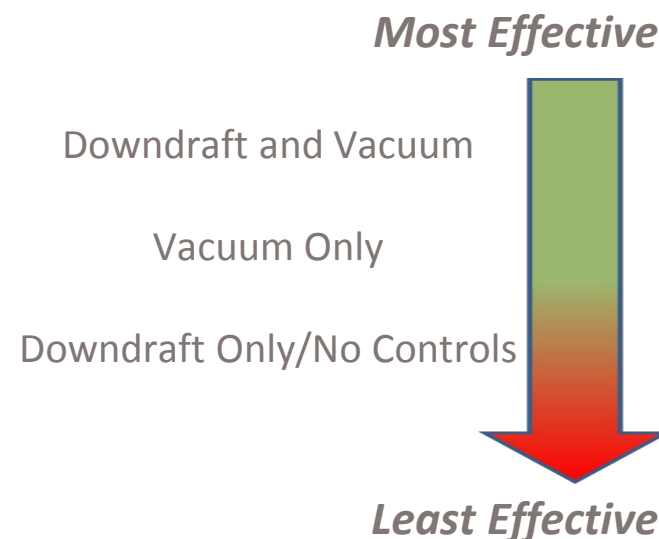
p<0.10; *** p<0.001



HAND TOOL INTERVENTION EXPERIMENT: ROUTER

	Emission (mg/m ³)		
Controls	N	GM (GSD)	% difference (95%CL)
No Controls	4	0.6 (1.2)	-
Downdraft Table	4	0.8 (1.2)	34 (-29.5; 155.5)
Vacuum	4	0.4 (1.2)	-28 (-62.0; 37.7)
Downdraft + Vacuum	4	0.3 (1.2)	-43 (-69.8, 9.4)#

p<0.10



INTERVENTION TRIALED IN SIX WORKSHOPS

	Pre-Intervention Average Concentration (mg/m ³)		Post-Intervention Average Concentration (mg/m ³)		Post-Pre intervention Difference (95% CL)
Joineries	N	GM (GSD)	N	GM (GSD)	%
Low Control	6	1.7 (1.8)	6	1.3 (2.4)	-22.2 (-70.1; 32.6)
Low 2	7	4.9 (2.1)	6	2.4 (2.6)	-49.9 (-82.4; 42.7)
Low 1	8	1.6 (2.1)	14	1.5 (2.2)	-8.8 (-55.7; 87.7)
High Control	15	5.7 (2.6)	14	3.8 (2.4)	-34.7 (-67.7; 32.6)
High 2	12	4.2 (1.5)	8	1.9 (2.0)	-55.0 (-72.6; -26.3)**
High 1	6	6.2 (1.6)	6	2.4 (2.1)	-61.8 (-82.4; -17%)*

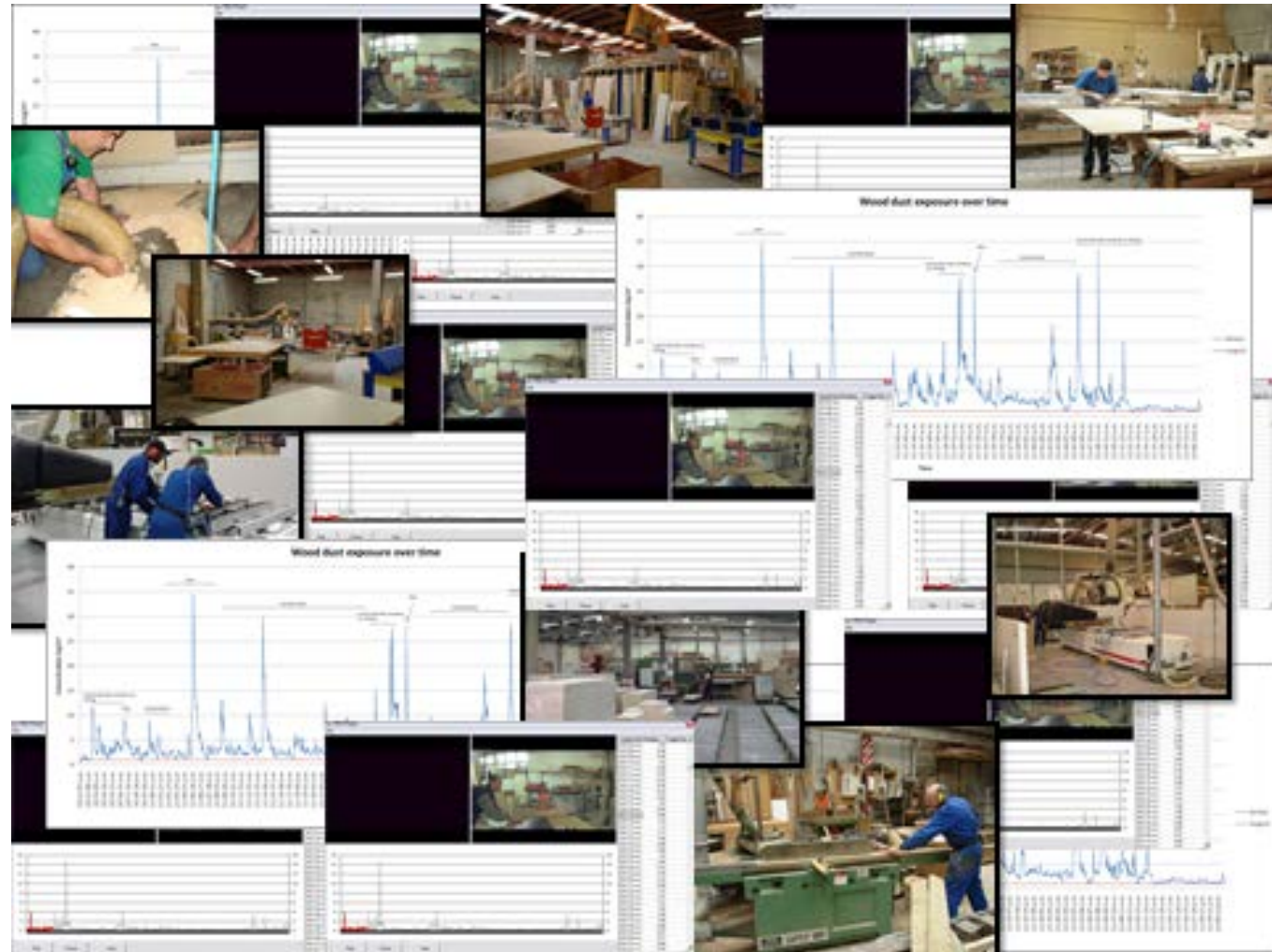
* p<0.05; **p<0.01

AN INTERVENTION STUDY IN JOINERY WORKERS: CONCLUSIONS

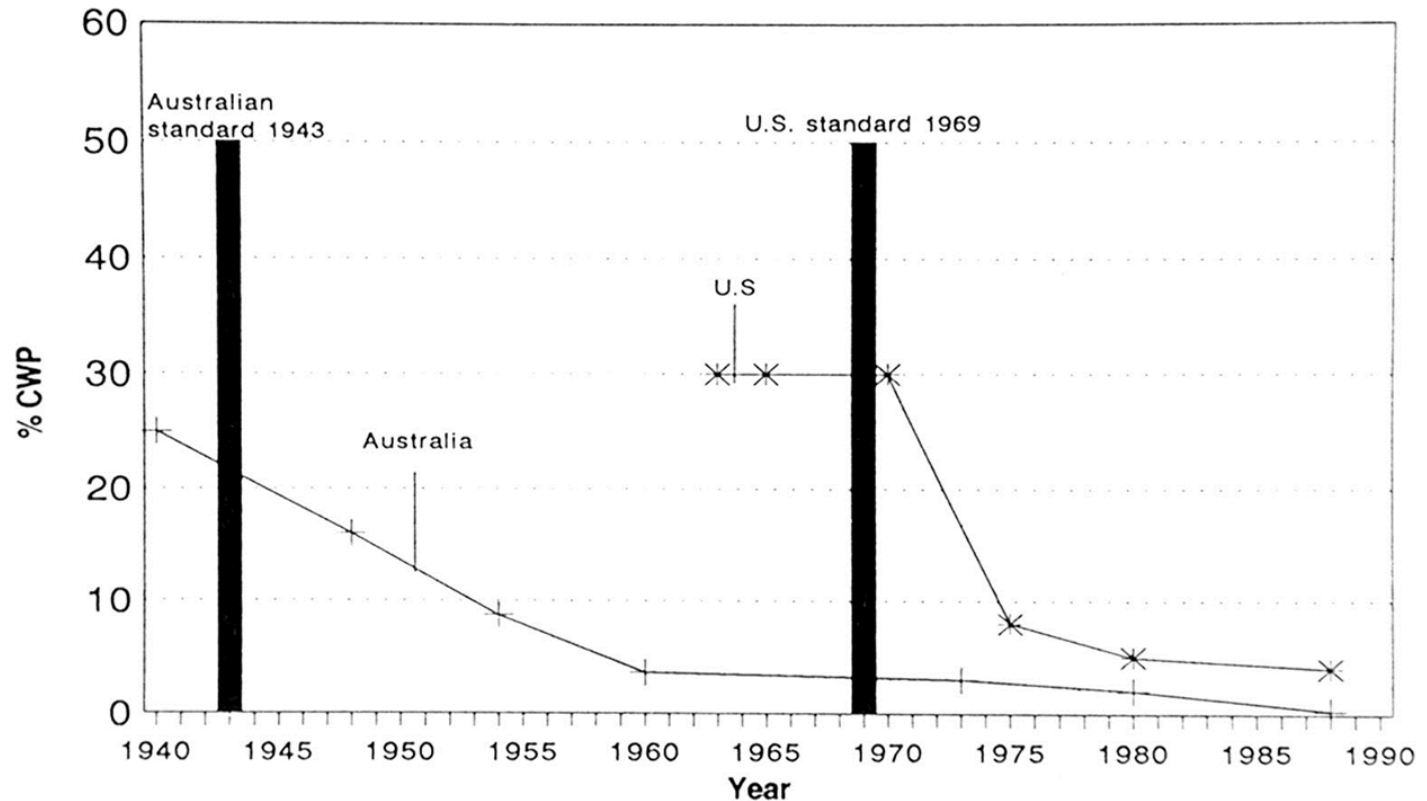
- significant reductions in wood dust exposure in joinery workers are achievable through the introduction of improved exhaust extraction and improved cleaning methods and general housekeeping.
- VEM is a powerful tool in identifying exposure peaks and has the potential to significantly contribute to more effective control options

WE NOW HAVE SOME 'NEW' TOOLS TO HELP US CONTRIBUTE TOWARDS SOLUTIONS

- VEM
- Dust
- Noise
- Solvents
- gasses
- UV
- Physical stress
- etc



LESSONS LEARNT: THE NEED FOR SOLUTIONS



Source: J. Leigh and B. Hull, 1995, Epidemiology Unit, Worksafe Australia

Figure 1

Coal workers pneumoconiosis (CWP)

OCCUPATIONAL ASTHMA: THE NEED FOR SOLUTIONS

- Olaus Magnus (1555)
 - "When sifting the chaff from the wheat, one must carefully consider the time when a suitable wind is available that sweeps away the harmful dust, so that it will not damage the vital organs of the threshers. This dust is so fine that it will almost unnoticeably penetrate into the mouth and accumulate in the throat. If this is not quickly dealt with by drinking fresh ale the thresher may never again or only for a short period eat what he has threshed"

HEALTH RISKS IN THE CONSTRUCTION INDUSTRY

- Noise induced hearing loss
- Hand arm vibration
- Musculoskeletal effects
- Contact dermatitis
- Psychosocial effects
- Neurotoxic effects
- Cancer (asbestos, silica dust, wood dust, fumes, UV radiation)
- Respiratory effects (asbestos, silica dust, wood dust)
- **Safeguard Magazine**



Thank you



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