

Shipping Container Inspection Safety Technology

WCO Tokyo Nov 1st 2017

Wil Grullemans – GM Nordiko



Are you protecting your import container inspection officers from toxic gas exposure?

Customs staff are being unknowingly exposed to fumigant and other toxic industrial chemical gases when entering containers.



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Knowledge is Critical



NORDIKO
QUARANTINE SYSTEMS PTY LTD

**Nordiko gas testing
and ventilation is simple,
addresses health risks
and improves
turnaround time**

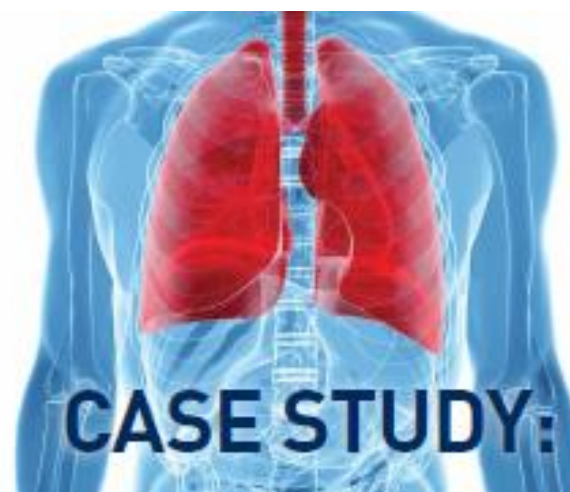
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Some Origins of Toxic Gas in Containers:

TOXIC GAS	HEALTH RISK	TYPICAL SOURCE
FUMIGANTS		
CHLOROPICRIN	POISON & LACHRIMATOR	FUMIGATION
ETHYLENE DIBROMIDE	PROBABLE CARCINOGEN	FUMIGATION
ETHYLENE OXIDE	CARCINOGEN & TISSUE DESTRUCTOR	PHARMACEUTICAL TREATMENT
HYDROGEN CYANIDE	RESPIRATORY TOXIN	FUMIGATION
METHYL BROMIDE	NEUROTOXIN	QUARANTINE TREATMENT
PHOSPHINE	CARDIOVASCULAR POISON	FUMIGATION
FORMALDEHYDE	CARCINOGEN	PRESERVATION
TOXIC INDUSTRIAL CHEMICALS		
AMMONIA	CELL MEMBRANE NECROSIS	RUBBER PRODUCTS
BENZENE	CARCINOGEN	MACHINERY
TOLUENE	NEUROTOXIN	SHOES
C ₃ ALKYL BENZENES	RESPIRATORY TOXIN	CLEANING AGENTS
STYRENE	NERVOUS SYSTEM DISRUPTION	PACKAGING FOAMS
1,3- BUTADIENE	PROBABLE CARCINOGEN	PLASTIC PACKAGING
TURPENTINE	RESPIRATORY IRRITANT	VARNISHES
DICHLOROMETHANE	CENTRAL NERVOUS SYSTEM DEPRESSION	CARPETS & RUGS
FORMALDEHYDE	CARCINOGEN	FURNITURE
VINYL CHLORIDE	LIVER DAMAGE & CANCER	PLASTICS
TRICHLOROETHYLENE	SYSTEMIC AUTOIMMUNE DISEASE	CLEANED METAL PRODUCTS
TETRACHLOROETHYLENE	PROBABLE CARCINOGEN	ELECTRONIC GOODS
ACETONE	DERMATITIS & SKIN DAMAGE	PAINTS & PLASTICS



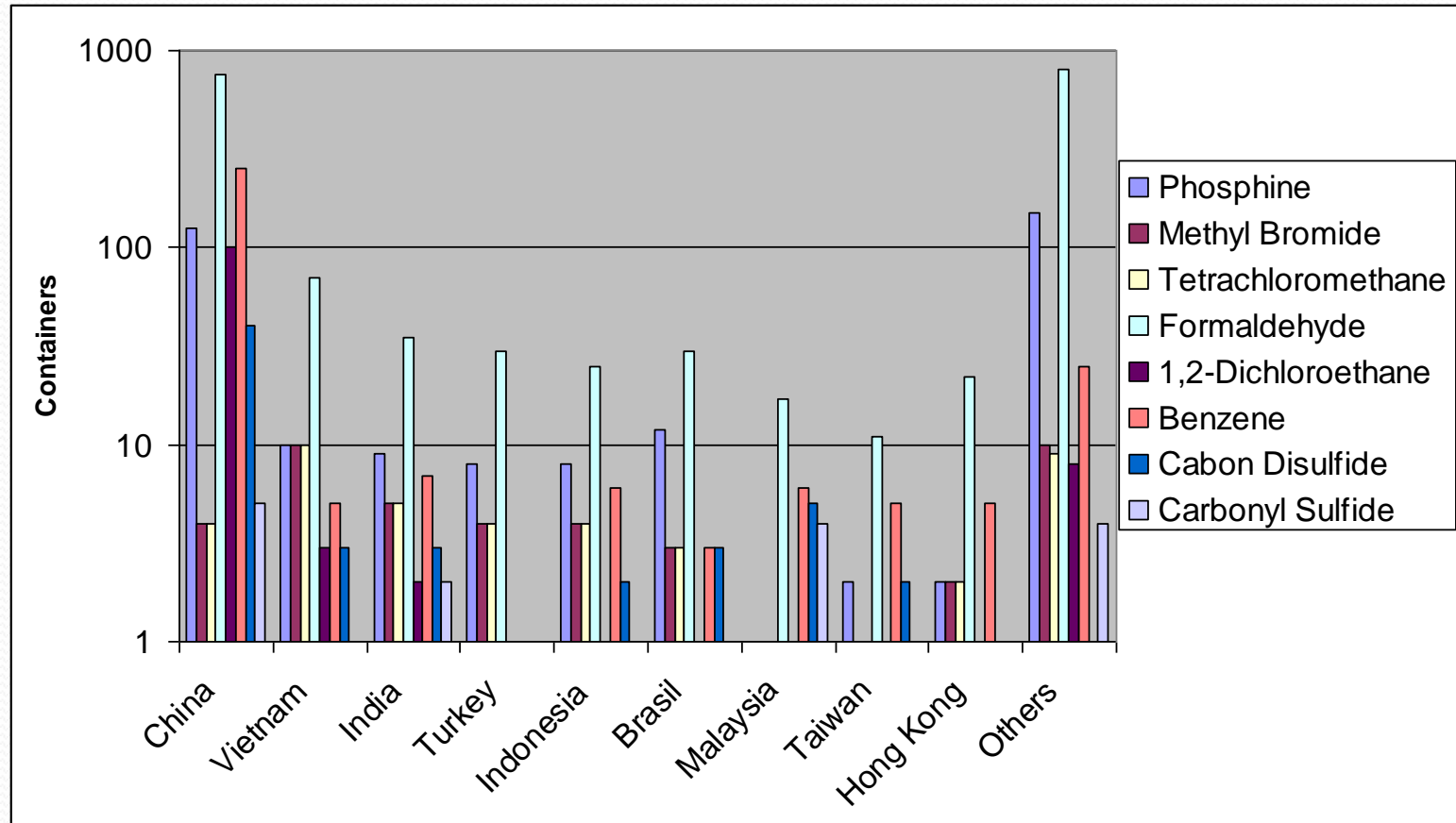
Residual Gas in Import Containers

Global Reports:

- France: INRS Govt Work Health Authority – 2014
- Sweden: Karolinska Institute - 2013
- New Zealand Customs: 519 containers 2012 - 18% unsafe
- Benelux: 20,000 containers 2013 - 12% unsafe
- Germany: 2,113 containers 2006 - 37% unsafe
- Netherlands: 1,000 containers 2007 - 21% unsafe
- Australian Customs: 45,000 tests 2008 -18% unsafe
- USA: Texas 262 containers 2012 - 21% unsafe



Toxic Gases found in European Import Containers



Source:

Int Marit Health. 2006 ;57 (1-4):46-55 17312693 (P,S,G,E,B)

[Health risks by bromomethane and other toxic gases in import cargo ship containers.](#)

[Xaver Baur, Fang Yu, Bernd Poschadel, Wim Veldman, Tosca Knol-de Vos](#)

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Some Reported Toxic Gas Incidents

Report No.	Location	Gas Type (if known)	Description:
Australia			
N001	Darwin	MB	Father and son team, son gassed and hospitalised
N002	Sydney	MB	Trainee entered container, gassed
N003	Adelaide	Unknown	Stevedore entered empty FCL and collapsed
N004	Adelaide	MB	Unpacking staff overcome by residual MB
N005	Sydney	MB	Warehouse worker unpacking FCL fumigated in India, feeling nauseous and vomiting
N006	Auckland	MB	Container doors opened, surrounding workers gassed
N007	Nelson	MB	Nearby cement silo workers affected by MB venting from timber container
N008	Carnarvon	PH3	Container unpacking staff affected by residual phosphine
N009	Caringbah	MB	Residual MB in containers from China, S.Africa and Brazil - feeling nauseous
N010	Brisbane	Formaldehyde	Formaldehyde inside shipping container, hospitalised
N011	Toowoomba	MB/CP	Container unpacking from India, warehouse staff affected
N012	Prospect	MB	Korean import FCL first-aid officer overcome in import container
N013	Arndell Park	Unknown	Unconscious person found inside shipping container, overcome by fumes
N014	Melbourne	MB	Unpacking staff affected and nauseous - 1200ppm MB inside fumigated (not aerated) shipping container
N015	Brisbane	MB	Sea Freight Council of Queensland issues Safety Alert due to large number of MB incidents
N016	Sydney	Formaldehyde	Indonesian outdoor furniture containers opened, workers gassed, WorkSafe investigation
N017	Australian Customs	Various	Unacceptable for any staff member to enter a container, unless checked for gas, and ventilated if needed
N018	Melbourne	Formaldehyde	Cheap chinese consumer goods warehouse container unpacking staff ill - Safe Work investigation
Overseas:			
N019	Los Angeles	MB	Safety Alert over Chinese shipping containers: high levels of gas found at all US west coast ports
N020	France	MB	Grain silo fumigation - 5 months bed-rest after exposure
N021	Florida	MB/CP	30 individuals affected by acute pesticide exposure
N022	California	MB	4 people violently ill after drift from a fumigation
N023	Netherlands	MB	Residual gas from KLM plane fumigation before take-off affecting crew
N024	S.Africa	MB	Residual gas from under-tarpaulin fumigation collapsed two people
N025	United Kingdom	MB	Container of teddy bears being unloaded, unloading staff hospitalised
N026	Los Angeles	Chemicals	Coastguard staff inspected container, chemical contents leaked staff hospitalised
N027	Hamburg	Various	Port Health Institute records show 1 residual gas incident unloading containers - each week!
N028	Holland	PH3	Container unpacking staff affected by phosphine, permanently in wheelchair, unfit for work
N029	EU Proposal	Various	Proposal that all container importers and unpackers have Risk Assessment and Management Plan



Example - German Incident : Toxic gas in shoe containers



- Fashion retailer Best Secret - warehouse in Germany
- Container unpacking staff seriously ill and hospitalized
- Shoe containers imported from China
- Toxic gases methyl bromide and toluene suspected
- Fire Brigade sent 15 vehicles
- 14 Medical Staff attended from Munich and elsewhere
- 7 people injured by toxic gas
- Severe eye, respiratory and nausea symptoms



Source: Merkur.de 15/3/16



Regulations growing around container inspection safety:

SafeWork Australia:

- Managing Risks of Hazardous Chemical Exposure in Import Containers
- Managing Risks of Methyl Bromide Exposure in Import Containers

German Legal Accident Insurance (DGUV):

- Danger when opening and unloading freight containers

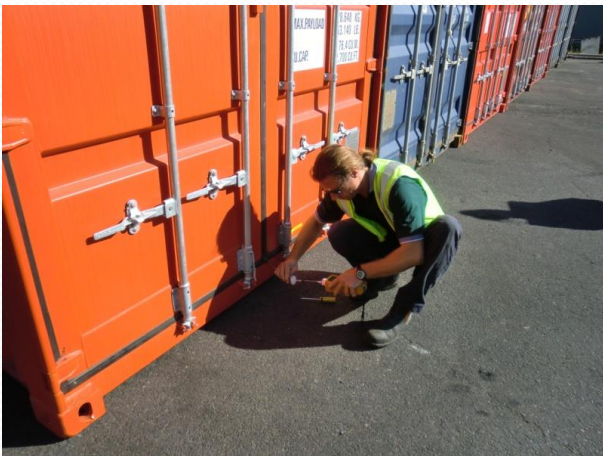
Worksafe New Zealand:

- Keeping Safe from harmful substances when inspecting or unloading shipping containers

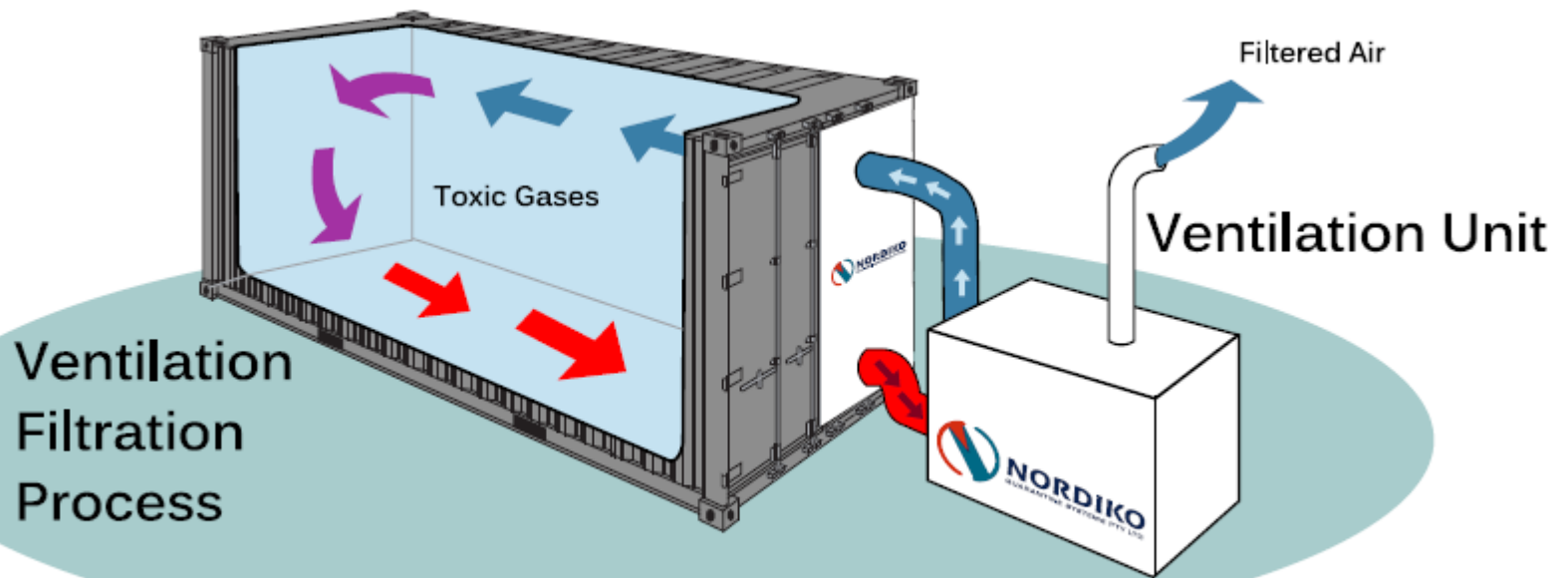


Best Practice - Customs Model

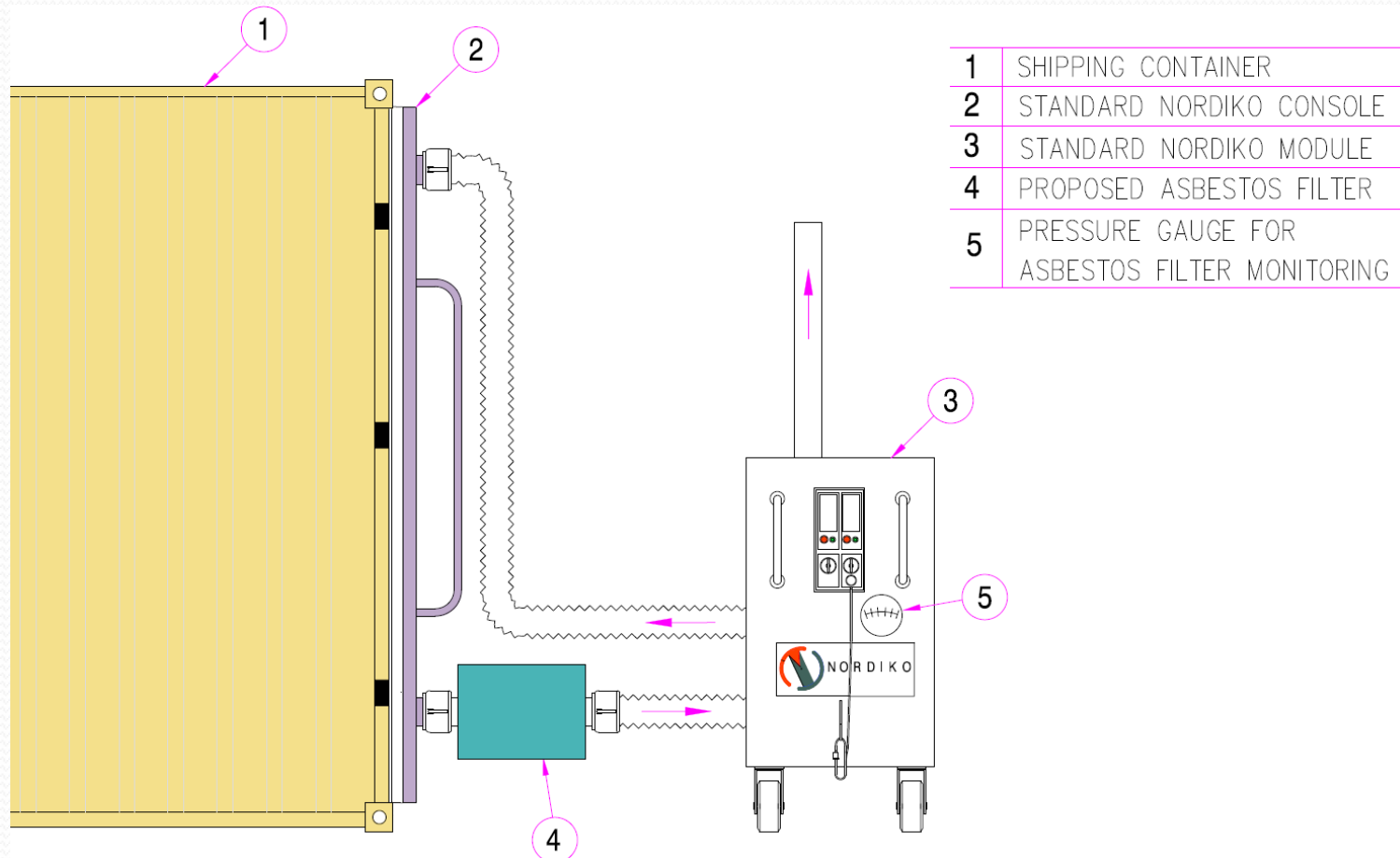
- Health & Safety Protocol established in consultation with experts
- Test for toxic gas in any suspect import containers to be inspected
- Any containers measuring above safe gas levels to be force ventilated
- After gas levels have reached safe standards, container can be inspected



Forced Ventilation of Shipping Container Prior to Inspection



Asbestos HEPA filter upgrade to Nordiko Units:



Open Container Doors vs Forced Ventilation

Source: INRS France Ann. Occup. Hyg. 2015, 1-14 Purging of Working Atmospheres Inside Freight Containers

Table 3. Summary of simulations performed under natural ventilation (12 m long, empty container).

	Wind angle of incidence θ (°)	Meteorological wind velocity V_m (m s ⁻¹)	Notes	Lowering times			
				t_1 (s)	t_2 (s)	t_3 (s)	t_4 (s)
B44	45.0	4.4	(1)	671	764	785	684
C31	45.0	3.1		1103	1542	1595	1313
C44	45.0	4.4		734	1003	1148	878
C56	45.0	5.6		555	821	854	679
C70	45.0	7.0		451	623	638	522
D44	22.5	4.4		212	298	368	257
E44	67.5	4.4		1059	1305	1370	1123

t_x is the concentration lowering time at sampling point x .

(1) without adjacent warehouse.

Table 4. Summary of simulations performed under forced ventilation (12 m long, full or partially full container).

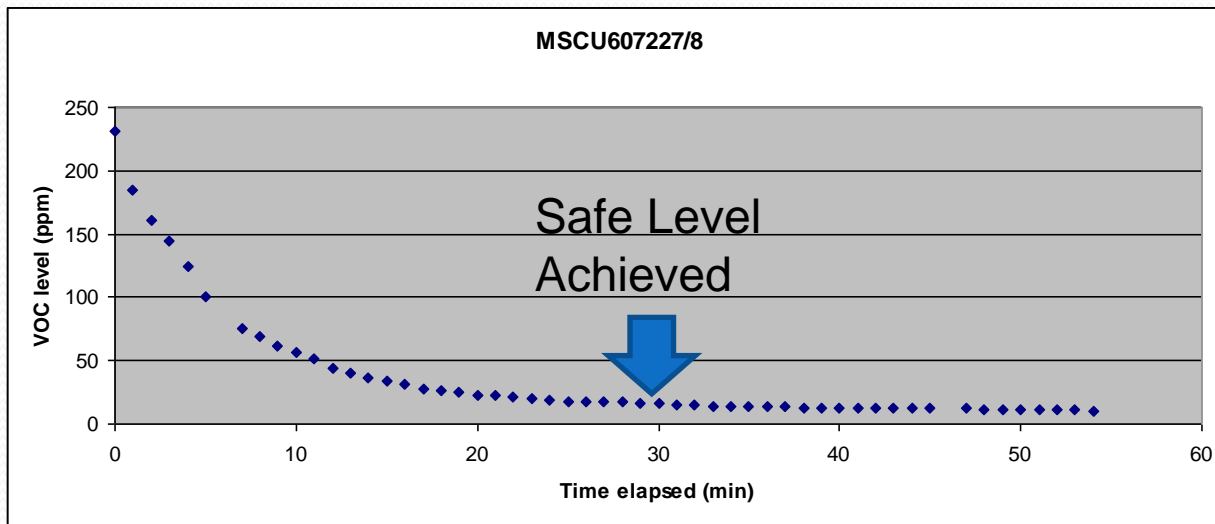
	Filling (%)	Rear orifice (cm ²)	Flow (m ³ h ⁻¹)	Air inlets	Air outlets	Lowering times			
						t_1 (s)	t_2 (s)	t_3 (s)	t_4 (s)
G68	79.6	78	680	R	2SL	179	239	199	188
H68	79.6	78	680	R	2SH	219	256	216	209
I68	79.6	78	680	2SL	R	46	527	518	394
J68	79.6	78	680	2SH	R	146	413	573	287
K68	79.6	398	680	R	2SH	244	352	276	237
K136	79.6	398	1360	R	2SH	119	193	136	117
M68	61.7	78	680	2SL	R	142	277	339	313
P56	79.6	0	557	FH	FL	224	240	309	226

t_x is the concentration lowering time at sampling point x .

Coding of orifices: R = rear, SL = side low, SH = side high, FL = front low, FH = front high.

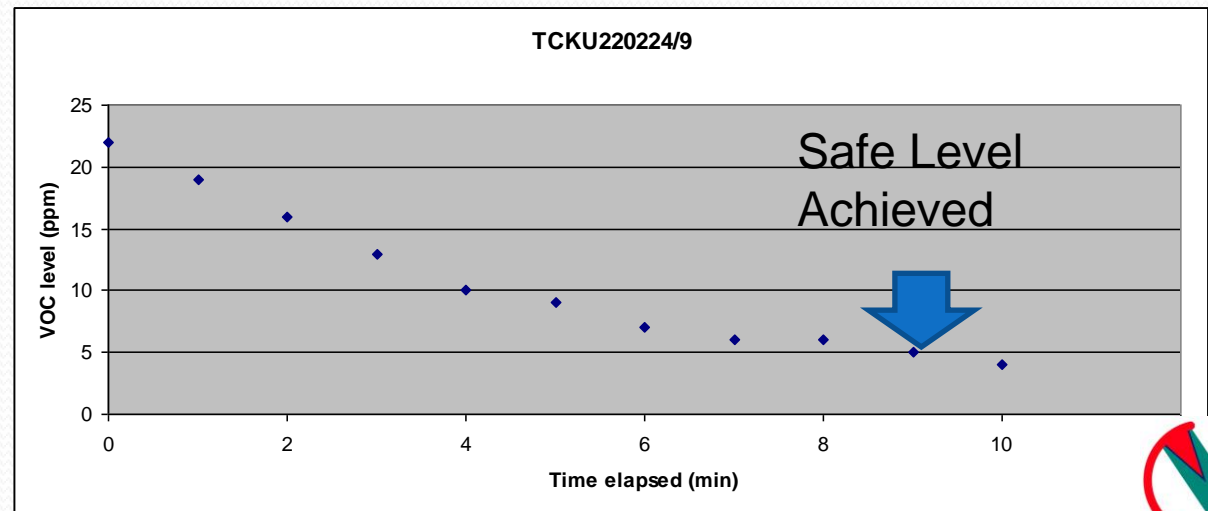


Examples of Forced Ventilation Results



Hitachi import
container from Italy

Hitachi import
container from Japan



Nordiko Equipment for Forced Ventilation



Customs Filter Model



Commercial Filter Model



Commercial Model



Forced Ventilation Equipment Features



- Multiple air exchanges > 10m³/min
- Hours run meter and vent timer
- Single or 3-phase power options
- Residual Current Device safety
- Emergency stop function
- Two step start-up operation
- Temperature and humidity readings
- Activated carbon air filtration
- Suits 8'6" & 9'6" containers



Benefits of Nordiko Equipment

- Ensure safe work processes for container inspection staff
- Improve container turnaround times at inspection locations
- Prevent emission of toxic gases which damage the environment
- Meet work hygiene and safety regulation requirements



Nordiko Quarantine Systems Pty Ltd

- Established in 2000 following government concerns over toxic gases being found in shipping containers
- First commercial systems to recapture fumigation emissions 2002
- Remove and recapture residual toxic gases (including non fumigants) from shipping containers
- Focus on improved work health safety and environmental impacts
- Now in 2017 - equipment in over 35 countries



Current users of Nordiko container degassing equipment:

Customs authorities eg:

- Australia
- New Zealand
- Canada
- Papua New Guinea

Multinationals eg:

- Worldwide furniture homewares retailer
 - Toyota
 - Hitachi
-
- Geographically: By 2017 - in 35 countries



Nordiko Fumigation Recapture Division:

- Container to very large scale fumigant recapture from industry and quarantine applications
- Equipment installed in many countries: USA, Singapore, Australia, Thailand, Hawaii, Chile, Mexico, New Zealand, Malaysia, China
- Used to meet EPA requirements for Methyl Bromide, Phosphine and other gas emissions
- Eg 20,000m³ grain silos Newcastle & Multiple large rice silos in Australia





Nordiko Achievements

- Equipment in 35 countries
- Awards Won
 - 2008 US EPA Ozone Protection
 - 2008/09 Premier's NSW Export
 - 2007 Lloyd's List DCN Award
 - 2001 AQIS Award
- Attend as Industry representatives Montreal Protocol Working Group Meetings



Summary

- Inspection of Shipping Containers can be hazardous but can be mitigated through
 - **Measurement** of gas levels before opening
 - **Forced Ventilation** of gas if detected before entering
- Hazards can come from both **Fumigants and - surprisingly - Toxic Industrial Chemicals**
- **Nordiko have proven reliable solutions** to support a safer workplace for all staff



**Thank you for your
attention**

**Please come and see
Nordiko at Booth 17**

Nordiko video presentation:

