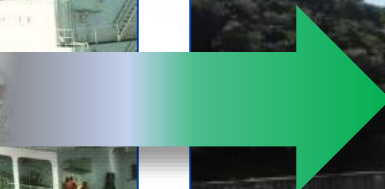


DUST FREE

Containerised Bulk Handling

Case Studies of Ports adopting innovative systems to stop dust pollution



AIR POLLUTION:

Workers who are involved in the daily handling of certain bulk cargo are exposing themselves to harmful airborne pollutants which cause respiratory problems.

This exposure can lead to lung diseases such as:

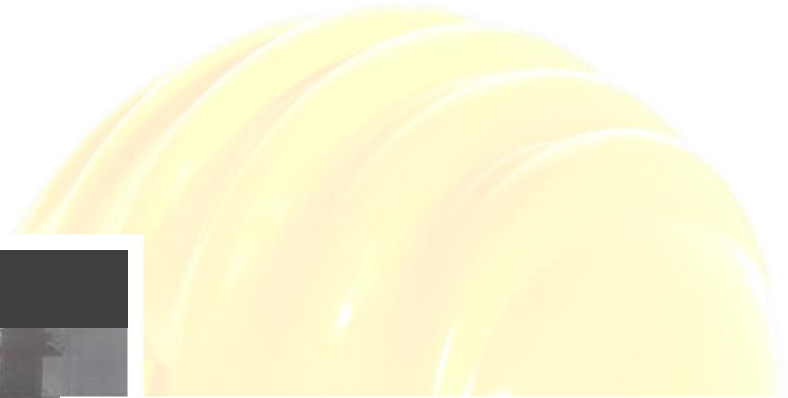
Silo-Filler's disease



Black Lung disease



Farmer's Lung disease



AIR POLLUTION:

Silo-Filler's disease

Caused by exposure to nitrogen oxide gas which is given off during grain fermentation in the silo. As nitrogen oxide is heavier than air it can escape through the silo chute into barn areas.



AIR POLLUTION:

Black Lung disease

Caused by exposure to coal dust with similar symptoms to inhaling silica dust and tobacco smoke.



AIR POLLUTION:

Farmers Lung disease

Caused by exposure to tiny microorganisms which inhabit moldy hay. Inhaled it provokes the creation of antibodies that circulate the bloodstream.



AIR POLLUTION:

In order to reduce airborne pollution and meet global environmental guidelines,

bulk ports, terminals and bulk commodity handling facilities are having to find ways to **reduce the levels of dust generated during the handling and unloading of bulk commodities.**



SOURCES OF DUST



SOURCES OF DUST



TRANSFER POINTS

OPEN WAGONS
OPEN STOCKPILES
SHIP LOADING



SOURCES OF DUST

TRANSFER POINTS
OPEN WAGONS
OPEN STOCKPILES
SHIP LOADING



SOURCES OF DUST

TRANSFER POINTS
OPEN WAGONS
OPEN STOCKPILES
SHIP LOADING



SOURCES OF DUST

TRANSFER POINTS
OPEN WAGONS
OPEN STOCKPILES
SHIP LOADING



SOURCES OF DUST

During these processes the commodity is handled **multiple times** resulting in ***losses and dust!***



SOURCES OF DUST

Dust is generated **at any point**
in the logistic cycle
when energy is added to materials



CURRENT BULK HANDLING METHODS

Many companies are now looking at systems **to reduce** levels of contamination, but also cost effective systems to meet current environmental guidelines



| **FILL** | **TRANSPORT** | **STORE** | **LOAD** |

Containerised BULK HANDLING



A NEW METHOD OF HANDLING BULK

A new method to export bulk is available

Containerised Bulk Handling is in operation at various bulk and standard container terminals and has already won 2 awards for its environmental benefits and innovative technology



CONTAINERISED BULK HANDLING

The CBH system uses:
Sealed containers as a method of storage and transport...

...either by rail

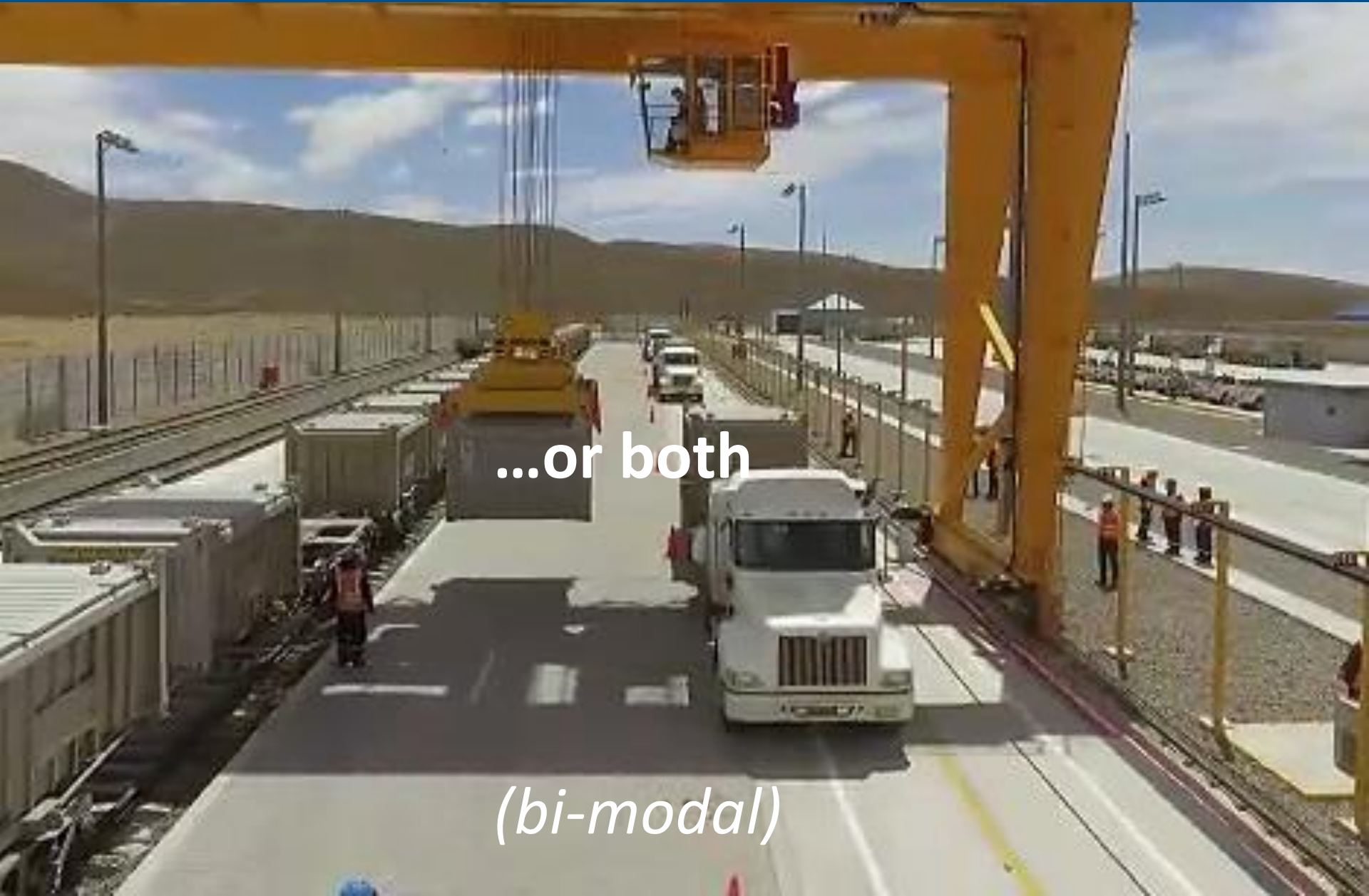


CONTAINERISED BULK HANDLING



...or by road

CONTAINERISED BULK HANDLING



...or both

(bi-modal)

CONTAINERISED BULK HANDLING



The CBH system also uses:
 RAM Revolver[®], a rotating spreader which handles the container, lifts the lid and rotates the container, gently tipping the commodity out.

CONTAINERISED BULK HANDLING



CONTAINERISED BULK HANDLING

THE PROCESS



FILL the CONTAINER at the MINE

- *EXISTING SITE EQUIPMENT USED*
- *NO LOSS OF COMMODITY*
- *NO CLEAN UP REQUIRED*

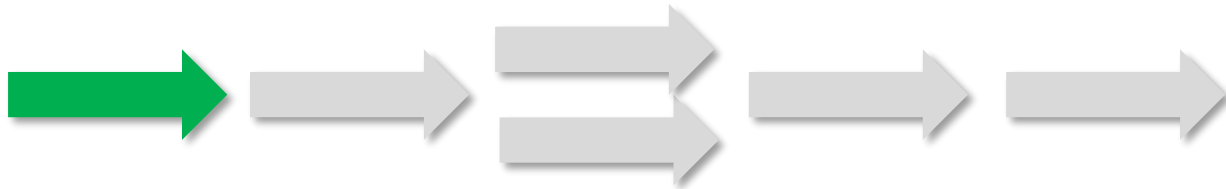
FILL

SEAL

TRANSPORT

STORE

LOAD



CONTAINERISED BULK HANDLING

THE PROCESS



FILL
SEAL

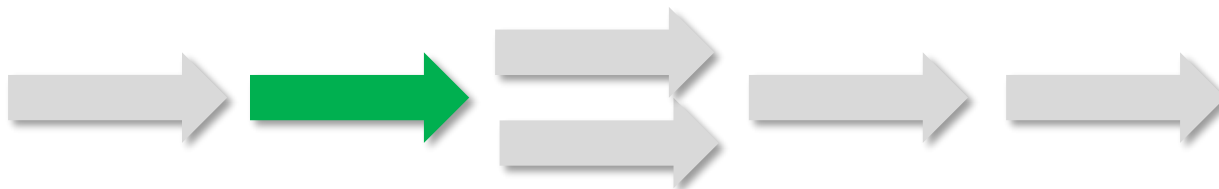
TRANSPORT

STORE

LOAD

SEAL the CONTAINER

- EXISTING SITE EQUIPMENT USED
- SELF LOCKING LID SYSTEM
- SEALS COMMODITY UNTIL LOADING
- NO CONTAMINATION



CONTAINERISED BULK HANDLING

THE PROCESS



SEND CONTAINER by RAIL

- *SEALED CONTAINERS – NO DUST*
- *NO CONTAMINATION*
- *NO LOSS OF COMMODITY*

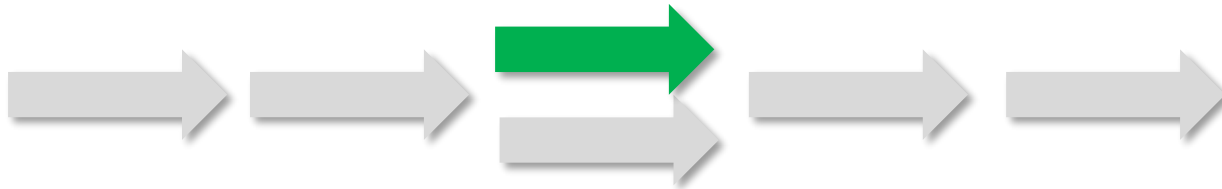
FILL

SEAL

TRANSPORT

STORE

LOAD



CONTAINERISED BULK HANDLING

THE PROCESS



FILL

SEAL

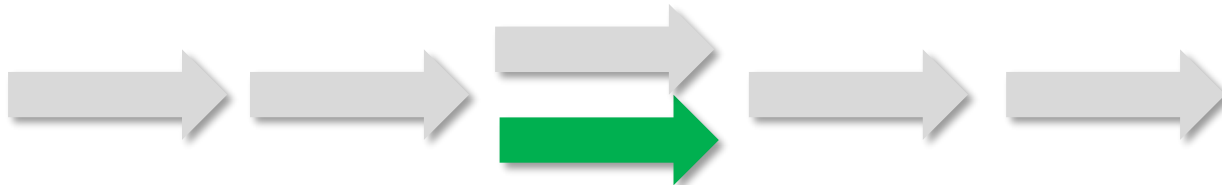
TRANSPORT

STORE

LOAD

Or SEND CONTAINER by ROAD

- *USING EXISTING ROAD NETWORK*



CONTAINERISED BULK HANDLING

THE PROCESS



FILL

SEAL

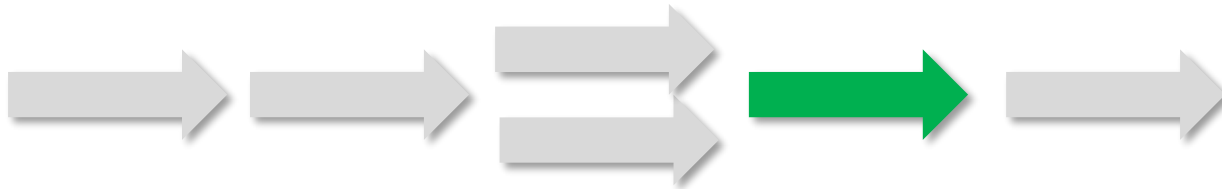
TRANSPORT

STORE

LOAD

STORE CONTAINERS AT PORT

- ***NO STOCK PILE – NO DUST***
- ***NO CONTAMINATION***
- ***FAST & EFFICIENT LOADING***
- ***STORE MULTIPLE TYPES OF COMMODITIES AT SAME AREA WITH NO CROSS CONTAMINATION***



CONTAINERISED BULK HANDLING

THE PROCESS

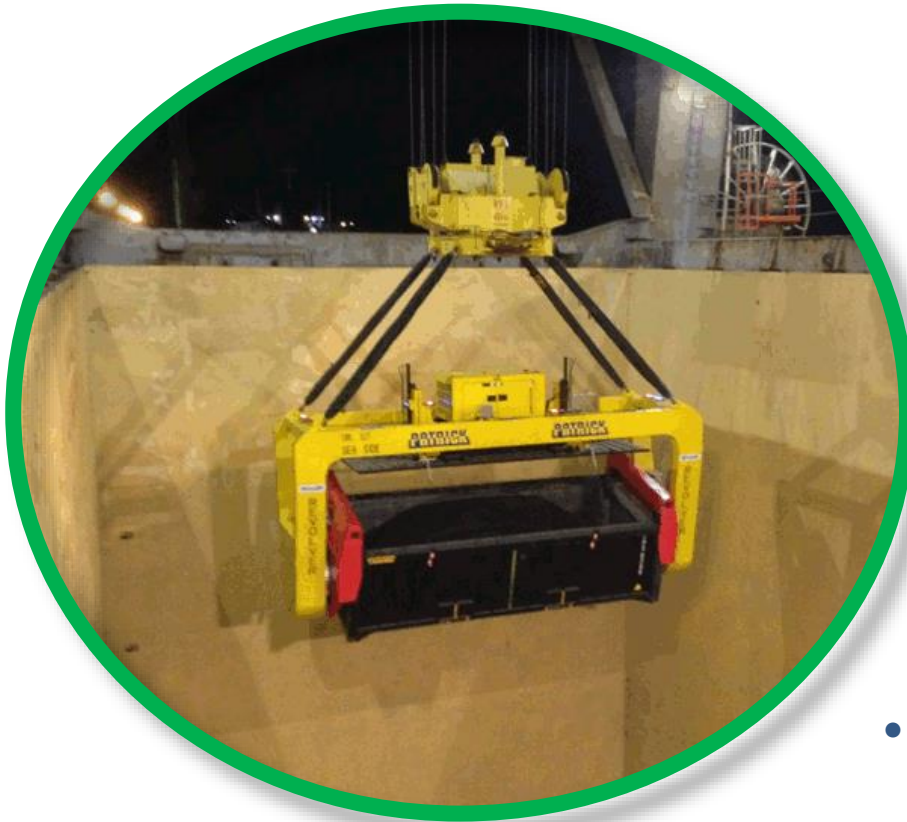
FILL

SEAL

TRANSPORT

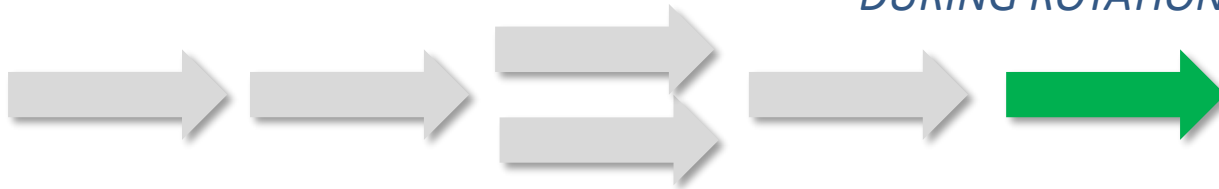
STORE

LOAD



LOAD using RAM Revolver

- FOR ALL TYPES OF CRANE
- LOADS OF UP TO **1,000 TPH***
*subject to commodity & loading conditions
- SWL – UP TO 45T
- **LID LIFTER TECHNOLOGY – NO CONTAMINATION – NO DUST**
- **TWISTLOCK & GRIPPERS SECURE CONTAINER DURING ROTATION**



CONTAINERISED BULK HANDLING

MISTING SYSTEM



MISTING SYTEM

OFF



MISTING SYSTEM

ON

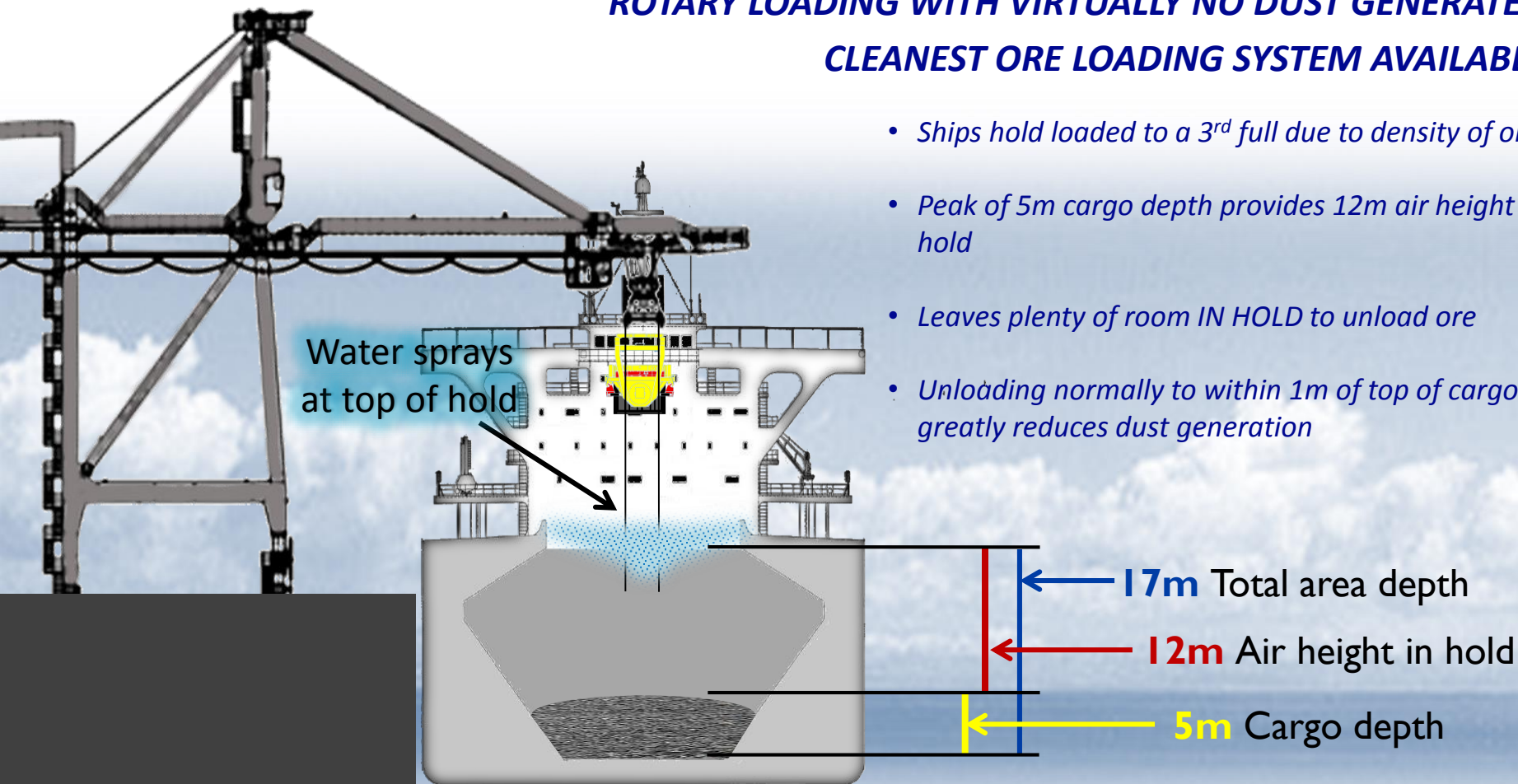
contamination
material loss

CONTAINERISED BULK HANDLING

LOADING PROCESS

**ROTARY LOADING WITH VIRTUALLY NO DUST GENERATED
CLEANEST ORE LOADING SYSTEM AVAILABLE**

- Ships hold loaded to a 3rd full due to density of ore
- Peak of 5m cargo depth provides 12m air height in hold
- Leaves plenty of room IN HOLD to unload ore
- Unloading normally to within 1m of top of cargo – greatly reduces dust generation



CONTAINERISED BULK HANDLING

CBH BENEFITS

COST

Lower set up costs

*No conveyor,
ship loaders or
storage sheds*

ENVIRONMENTAL

Zero Dust - No clean up

*Best practice by EPA
with fast approval*

SAFE & FAST

Virtually unmanned
operation

*With loading rates
of 1000 tonnes per
crane per hour*

PROVEN & REPRODUCIBLE

Providing a simple
proven turnkey
solution to
importers



CASE STUDY 1

COMPANY: Transnet Port Elizabeth

COMMODITY: Manganese

EQUIPMENT: Ship to Shore Crane

CASE STUDY 1

PORT ELIZABETH

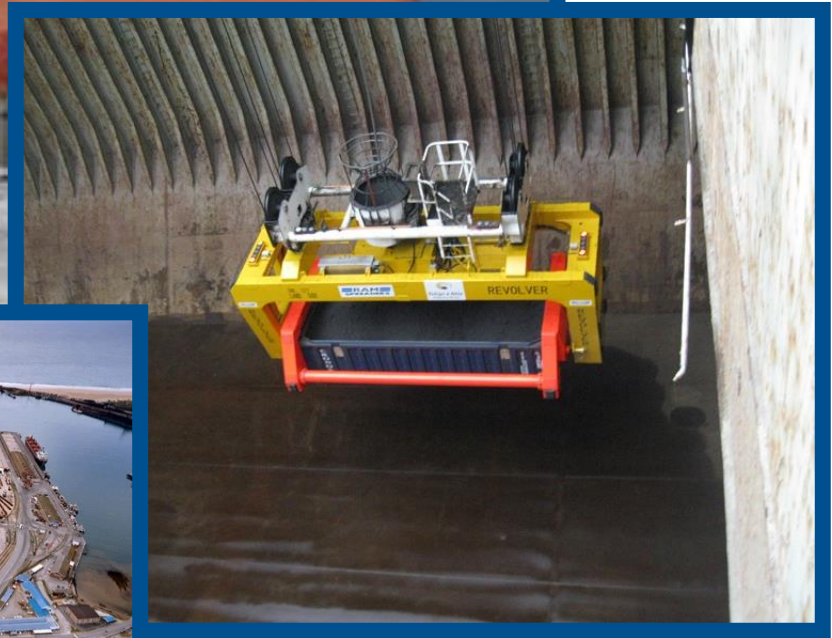
South Africa



CASE STUDY 1

PORT ELIZABETH

South Africa



CASE STUDY 1

PORT ELIZABETH

South Africa



Tshipi é Ntle
Manganese Mining



CASE STUDY 1

PORT ELIZABETH

South Africa



Tshipi é Ntle
Manganese Mining



CASE STUDY 1

PORT ELIZABETH

South Africa



Transnet's introduction of Containerised Bulk Handling delights customers and is breaking bulk handling records in South Africa

12
145,230

= A record breaking 14,230 tonnes of manganese was loaded in just 12 hours

CASE STUDY 2

A yellow RAM spreader is being lifted by a ship crane. The spreader is suspended by several cables and is positioned over a large, open hold on a ship's deck. The spreader has a red hopper at the bottom and is currently empty. The background shows the ship's structure and a ladder.

COMPANY: TPR Rosario

COMMODITY: Grain

EQUIPMENT: Ship Crane

CASE STUDY 2

TPR Rosario - Argentina

Overview

TPR Rosario is the first terminal in the world to utilize Containerised Bulk Handling.

The terminal is a key gateway hub for Argentina, handling all types of import and export cargo.



CASE STUDY 2

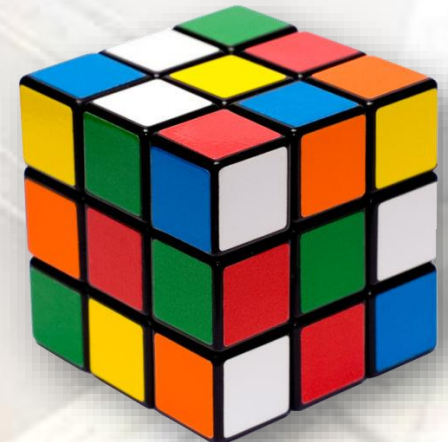
TPR Rosario - Argentina

Challenges

Growing business of exporting grain required TPR to find a method to improve productivity whilst also simplifying the operation.

Limited investment capacity – existing equipment has to be used or modified.

Traditional contamination of commodity from open stockpiles.



CASE STUDY 2

TPR Rosario - Argentina

Fill at the Farm

Agri-bulk loaded into specially designed high cube 20ft containers



Containers as Transport **and** Silo

Multipurpose use:

Fill | Transport | Store | Empty | Re-use



CASE STUDY 2

TPR Rosario - Argentina

The Problem

Contamination of Commodity

Open stockpiles at risk of “spoil” due to:

- **Contamination** from vermin & birds
- **Moisture**
- **Airborne contaminants**
- **Open top transport** from farm to port
- **Other physical** external contaminants



The Solution

Contamination free

CBH contamination free process down to:

Commodity

- Being stored in **sealed** containers
- Kept secure and dry throughout the process

Lid on Container

- Lifted **only** during rotation of commodity into the ships hold



CASE STUDY 2

TPR Rosario - Argentina

Benefits

- **Fast loading rates with CBH**
- **Handling process can be as high as 25 cycles per hour**
- **Up to 1,000 tons per hour can be achieved**
- **Minimal material loss**
- **Innovative lid system means no material loss during CBH process**



CASE STUDY 2

TPR Rosario - Argentina

Solution

Any container terminal

- *CBH allows exporters to take the grain to any container terminal*

Storage – Sealed Container

- *Grain stored in high cube 20ft or 40ft containers with lids*
- *No material loss*

Portable

- *Containers can be re-located to other operation port **with the rotating spreader***



CASE STUDY 3

A faded background image of a ship's deck. A large yellow and red crane is visible on the left, lifting a container. Two workers in yellow high-visibility jackets and white hard hats are standing in the foreground, looking at a document. The deck is wet, and there are various pieces of equipment and containers scattered around.

COMPANY: Patrick Ports & Stevedoring

COMMODITY: Copper Concentrate

EQUIPMENT: Ship Crane

CASE STUDY 3



15 Lifts per hour

Tonnes per crane per hour

400

2 Cranes

18000

Tonnes per day



**CASE
STUDY**

TESTIMONIALS

CASE STUDY - TESTIMONIAL

Environmental Benefits

“Turning DP World Adelaide from a standard container terminal into a bulk handling terminal raised an interesting reaction”.

“The sailing squadron next to the terminal came to me one day to protest about the new system of bulk export being introduced at the terminal, and they wouldn’t allow us to operate the system as it would create red dust on their sailing boats”.

*“They had slack jaws when I told them **the system had already been running for six months with zero emissions**”*



Ray Lee
Regional Director
DPW Australia | 2009-2011

DPW Adelaide

CASE STUDY - TESTIMONIAL

...and terminal growth

“DPW Adelaide was an under utilized terminal with low berth occupancy and little growth prospects”

“...to grow the terminal we needed to think outside traditional income sources”



Ray Lee
Regional Director
DPW Australia | 2009-2011

DPW Adelaide

CASE STUDY - TESTIMONIAL

Low capital expenditure

*“Patrick was able to utilize this new revolving spreader technology to export copper concentrate for our client **with very little capital**”*

*“Our Client was **extremely pleased** with the dust free solution”*



Adrian Howard
Commercial Director
Patrick Ports & Stevedoring

Patrick | Asciano

CASE STUDY - TESTIMONIAL

High loading rates minimize shipping costs

Miners Perspective

*“Environmentally **it is a very clean system** due to containers being emptied directly into the ship’s hold thereby **minimizing a number of dust generating points**”*

*“Loading rates of 15,000 wmt/day being achieved are such that it **helps to minimize shipping costs**”*

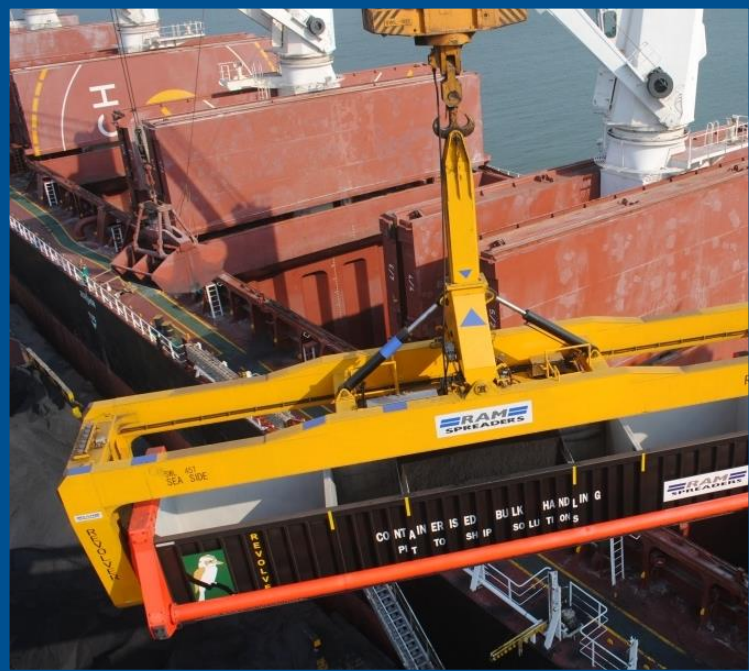


Jack Cole
North Park Mines

North Park Mines

CASE STUDY – FURTHER EXAMPLES

MAPUTO



COAL

- IRON ORE
- MANGANESE
- COPPER
- GRAIN

MHC CRANE

- SHIPS CRANE
- STS CRANE
- BRIDGE CRANE

CASE STUDY – FURTHER EXAMPLES

EAST LONDON



COAL

- IRON ORE
- MANGANESE
- COPPER
- GRAIN

MHC CRANE

- SHIPS CRANE
- STS CRANE
- BRIDGE CRANE



CASE STUDY – FURTHER EXAMPLES

ADELAIDE



IRONCLAD
MINING LIMITED



COAL

IRON ORE

MANGANESE

COPPER

GRAIN

MHC CRANE

SHIPS CRANE

STS CRANE

BRIDGE CRANE

CASE STUDY – FURTHER EXAMPLES

CONGO



COAL

IRON ORE

MANGANESE

COPPER

GRAIN

MHC CRANE

SHIPS CRANE

STS CRANE

BRIDGE CRANE

CASE STUDY – FURTHER EXAMPLES

CHILE



COAL
IRON ORE
MANGANESE
COPPER
GRAIN

MHC CRANE
SHIPS CRANE
STS CRANE
BRIDGE CRANE

CASE STUDY – FURTHER EXAMPLES

MAURITANIA



IRON ORE

CASE STUDY – FURTHER EXAMPLES

LAS BAMBAS - PERU



COAL
IRON ORE
MANGANESE

COPPER

GRAIN

MHC CRANE

SHIPS CRANE

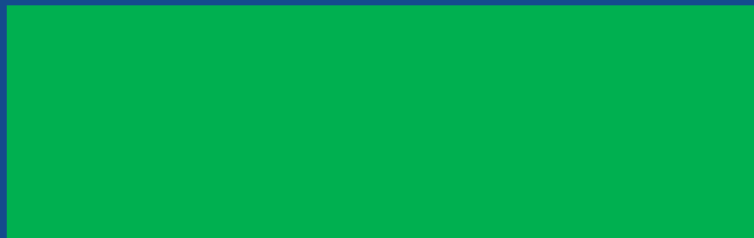
STS CRANE

BRIDGE CRANE

CASE STUDY

Reach Stacker Operation

BOLIVIA



CASE STUDY

Reach Stacker Operation

TURKEY



COSTINGS

CBH - COMPARISONS

MHC model



- *Cranes x 2 = USD\$ 8,000,000.00*
- *Containers x 30 = USD\$ 300,000.00*
- *CHE = USD\$ 500,000.00*
-  *Revolver's = USD\$ 1,500,000.00*

= 10 MILLION

Ships Crane model



-  *Revolver's x 2 = USD\$ 800,000.00*
- *Misting System = USD\$ 200,000.00*
- *Container = USD\$ Leased*
- *Fork Truck = USD\$ Leased*

= 1 MILLION

CONTAINERISED BULK HANDLING - BENEFITS

✓ **Flexible Berths** – No fixed bulk berths

✓ **Fast to start**

✓ **No dust**

✓ **Low cost**



CONTAINERISED BULK HANDLING - BENEFITS



Cost

- Lower set up costs (No conveyor, ship loaders, storage sheds)



Environmental

- Zero dust, no clean up
- Best practice by EPA with fast approval



Safe & Fast

- Virtually man less operation with loading rates of 1700 TPH per crane



Proven & Reproducible

- Providing a simple proven turnkey solution to exporters



EQUIPMENT

INTEGRATED APPROACH

Revolver®



Cranes



Dust Suppression



Container Handlers



Containers



REVOLVER trailer system

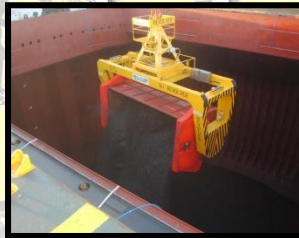


EQUIPMENT

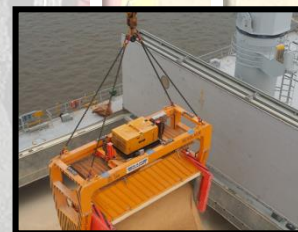
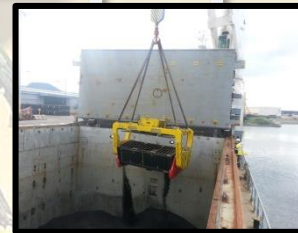
Ship to Shore



Mobile Harbour



Ship Crane



Reach Stacker



COMMODITIES HANDLED



Grains



Mineral Sands



Soya



Wood Chip



Copper Concentrate



Scrap Metal



Bagged Materials



Coal



Iron Ore



CBH COMPANIES

Exxaro

Grinrod

DP World

Eletheni/ SNR

BHP B

Oz Minerals

Hillgrove Copper

Transnet

FQML

TPR Argentina

Ironclad

Patrick

MMG Las Bambas

Riga Universal Terminals

ETI Bakir

Port of Quijarro

HPH Timsa





“Not often do you get a solution that is the lowest cost but also **Best Practice** environmentally”

RAM
SPREADERS



RAM SPREADERS

SWL 38T
SEA SIDE



RAM
SPREADERS

OSMAG
GROUP COMPANY

AWARD WINNING



Containerised Bulk Handling with RAM Revolver® is being recognized by the bulk handling industry as an innovative and environmentally friendly solution...

IBJ - 2014

Environmental Protection Award



RAM Spreaders & Patrick Ports and Stevedoring Australia

For contamination & dust free Containerised Bulk Handling

IBJ - 2016

Innovative Technology Award



RAM Spreaders & MMG Las Bambas Peru

For Bi-Modal Containerised Bulk Handling from Las Bambas Mine to Matarani Port