

# Innovative Approach to Minimise Container Port Footprint

IPIC 2023

9th International  
Physical Internet Conference

June 13-15, 2023  
Athens, Greece

Bruce Allen, Philip Norman, Russell Thompson, and Dimitris Tsolakis

## The Challenge

Expansion of the world's Container Ports is both uncontrollable and unsustainable.

Surging containerised-freight traffic flow creates major headaches for many:

- ◆ Governments,
- ◆ Port authorities,
- ◆ Transport industry, and
- ◆ The community.

Pressure on existing infrastructure causes:

- ◆ Congestion,
- ◆ Environmental degradation,
- ◆ Operating inefficiencies, and
- ◆ Increased operating cost challenges.



Over the last couple of decades there have been many proposed technological innovations, but very few have made it through to produce real-world efficiency gains. CFT innovation aims to break that mould and deliver tangible benefits.

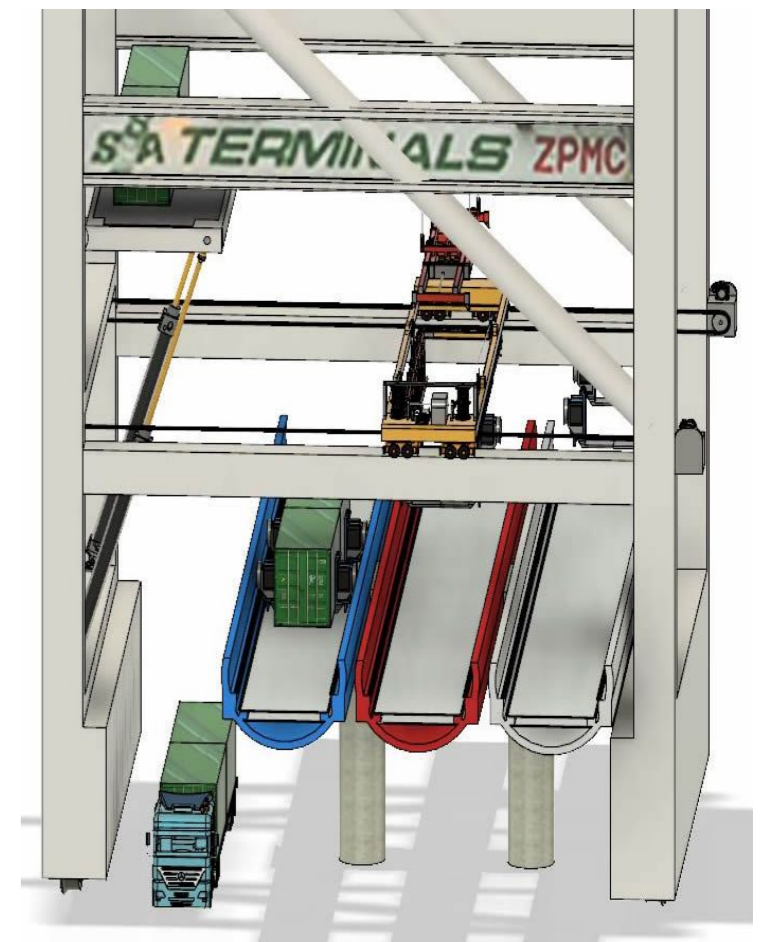
## Implementation Blockages

There are critical obstacles to overcome when considering the application success for these innovations. Three key phases of development and completion are required:

- ◆ Planning and design,
- ◆ Development and testing, and
- ◆ Participation of governments and other stakeholders during all implementation stages.

So where is CF Technologies currently positioned?

- ◆ Advanced stage of design and planning at the theoretical and research level,
- ◆ Advanced Patent development and registration in multiple jurisdictions,
- ◆ Early stage of testing and simulation modelling at a research level,
- ◆ Continuing search for funding to build a prototype, and
- ◆ Various levels of engagement with governments and stakeholders in Australia and elsewhere.

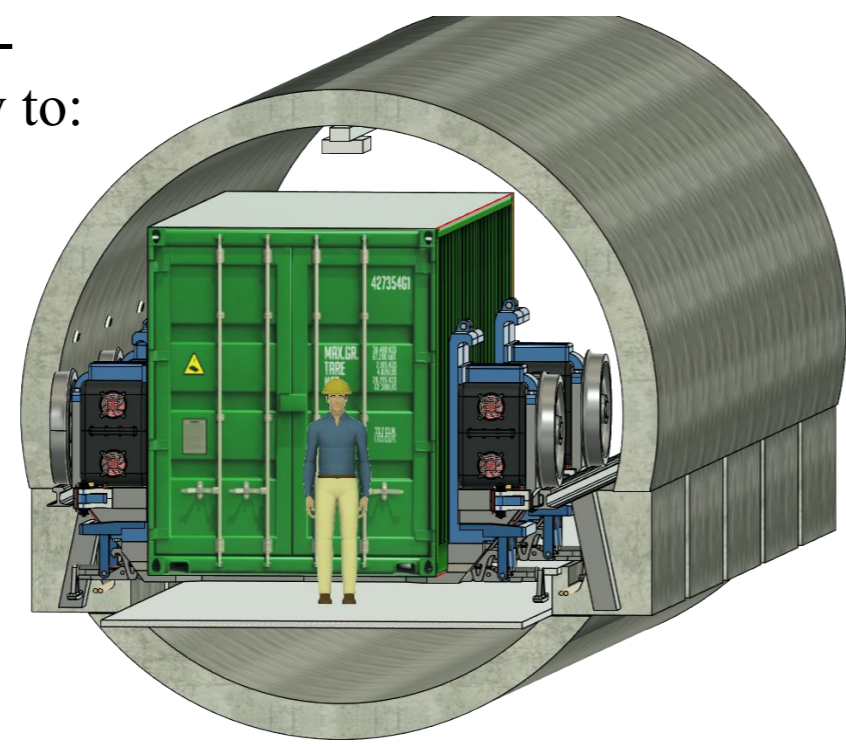


## The Paradigm Shift

The solution requires a paradigm shift in the way container ports are managed.

Innovative, sustainable and dedicated container-freight transportation infrastructure is necessary to:

- ◆ Provide seamless integration between ports and intermodal hubs, with ship unloading and loading techniques designed to maximise throughput
- ◆ Automate the transportation of urban freight, essential to reduce both operating and social-environmental costs



The CF Technologies (CFT) system offers such a paradigm shift, and facilitates seamless integration with existing infrastructure. CFT introduces a solution that matches ongoing long-term requirements. It is flexible, able to scale efficiently and cost-effectively as the context changes.

## Summary of Benefits

Environmental Benefits

- ◆ Low Noise
- ◆ Reduced Port Footprint
- ◆ No Pollution at the Point of Delivery
- ◆ Minimal Impact on Surrounding Community

Operational Benefits

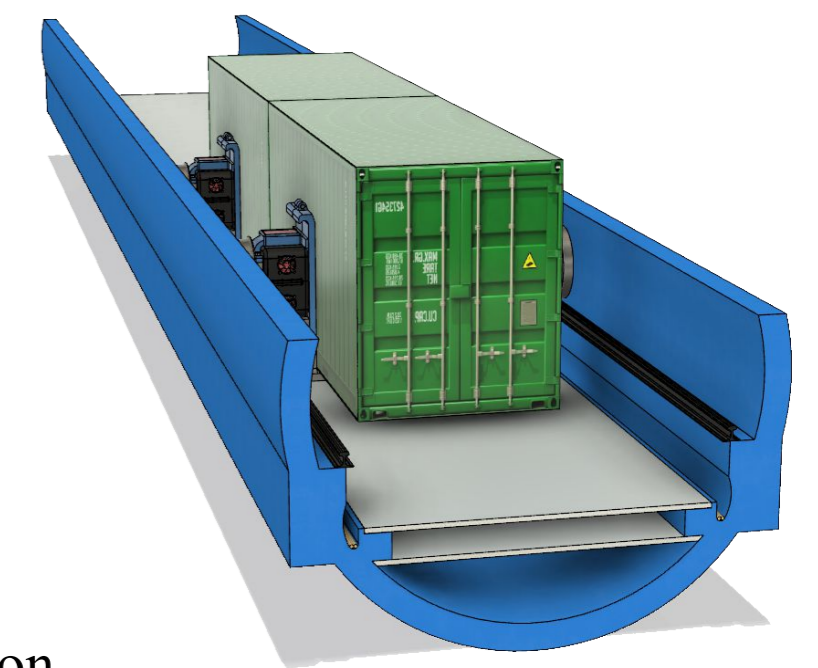
- ◆ Continuity of Container Flow
- ◆ Improved Crane Efficiency
- ◆ Reduced Need for Dock-side Storage
- ◆ Additional Flexibility for Track Routing
- ◆ Reduced Risk of Accidents due to Robotisation

Manufacturing Opportunities

- ◆ Local Design and Manufacture of Detachable Drive Units
- ◆ Develop Software for Central Control System
- ◆ Develop Communication System
- ◆ Pilot for Refinement and Testing of the Technology
- ◆ Establish New Construction Techniques for Pipe-Rail and Double Helix
- ◆ Research Crane Modifications to Improve Efficiency

Export Opportunities

- ◆ No System Like CFT Anywhere in the World
- ◆ Large Number of Docks Where Congestion is a Problem
- ◆ Increasing Competition for Valuable Dock-Side Real-Estate
- ◆ As International-Trade Grows, So Does the Demand for Continual Refinements to Ensure Maximum Freight-Handling Efficiency



## Key CFT Invention Features

All innovative features of the CFT system trace back to a simple core concept -- Attach wheels to a shipping container and turn it into a vehicle. The concept is not new, but no practical design has ever been successfully commercialised. Central to the CFT solution is the Detachable Drive Unit or DDU. These are electrically powered, semi-autonomous rail units that attach in pairs to containers when required, and can also function independently as vehicles without any container.

The attachment mechanism is novel in that it is automatic when the weight of a container is applied. But the most important unique feature of the wheels is their location relative to the vertical centre-of-gravity of the assembled vehicle. Being close to the centre is vital for minimising tipping forces when cornering at speed.

Combining the low centre-of-gravity with what is effectively a 4WD, split-axle vehicle, creates a huge advantage -- cornering radius at a given speed is much less than can be achieved with traditional rail systems. Not only does this allow for more flexibility in the layout of rail pathways, but it also leads to another unique CFT innovation -- the Double Helix. This intertwined bidirectional pathway can be implemented to shift containers vertically within a relatively small area.

Flexibility in rail pathways means that pipes conveying container-vehicles can be installed close enough to container ships to allow direct access by ship-to-shore gantries. Another CFT innovation relates to a gantry modification that claims to reduce ship loading and unloading times by about 20 percent.

## The Long Road Ahead

The huge investment associated with port infrastructure and freight logistics has resulted in a reluctance to adopt new technology in a timely manner. CFT faces many challenges in delivering a radical solution for an industry adverse to change.

Container Ports are increasingly constrained both in size and in number. For many existing ports, the need for a new approach is critical. The solution proposed with the CFT system provides continuous and immediate transfer of containers between ports and remote hubs, thereby reducing the required dock storage-area.

Collaboration is key to our future success, and our immediate aim is to validate the patented technology to the point where a major industry player might seek a controlling stake in CF Technologies P/L.

