
nti
DAIRY
TANKER
BASICS

nti DAIRY TANKER BASICS

ACKNOWLEDGEMENTS

This book was made possible by the contribution of many dairy industry participants, however the project team would like to note their particular gratitude to Australia's two pre-eminent dairy tanker manufacturers: Byford Equipment and Tieman Tankers. Their knowledge of dairy transport equipment is unequalled and they provided their time and expertise with goodwill and enthusiasm.

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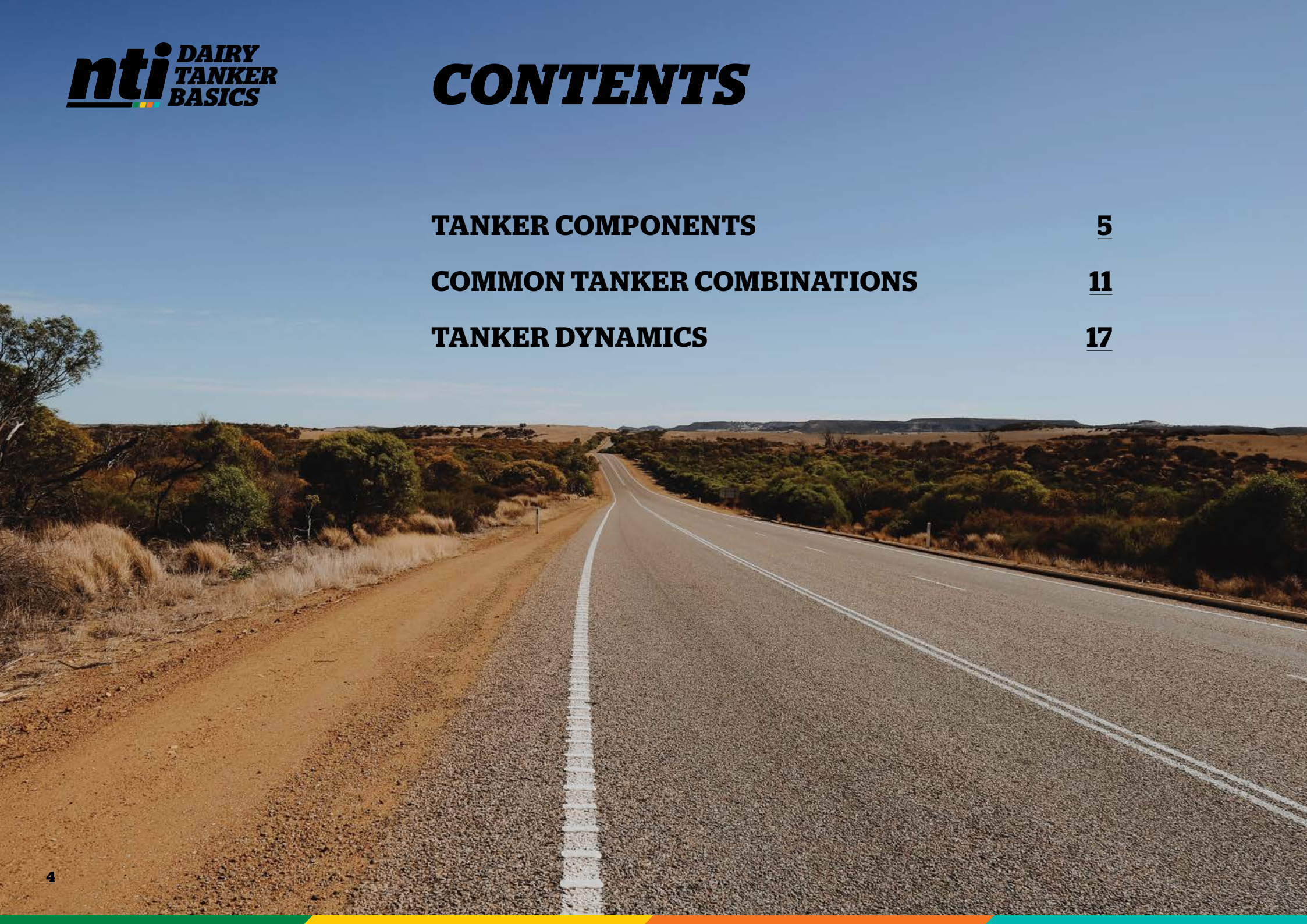
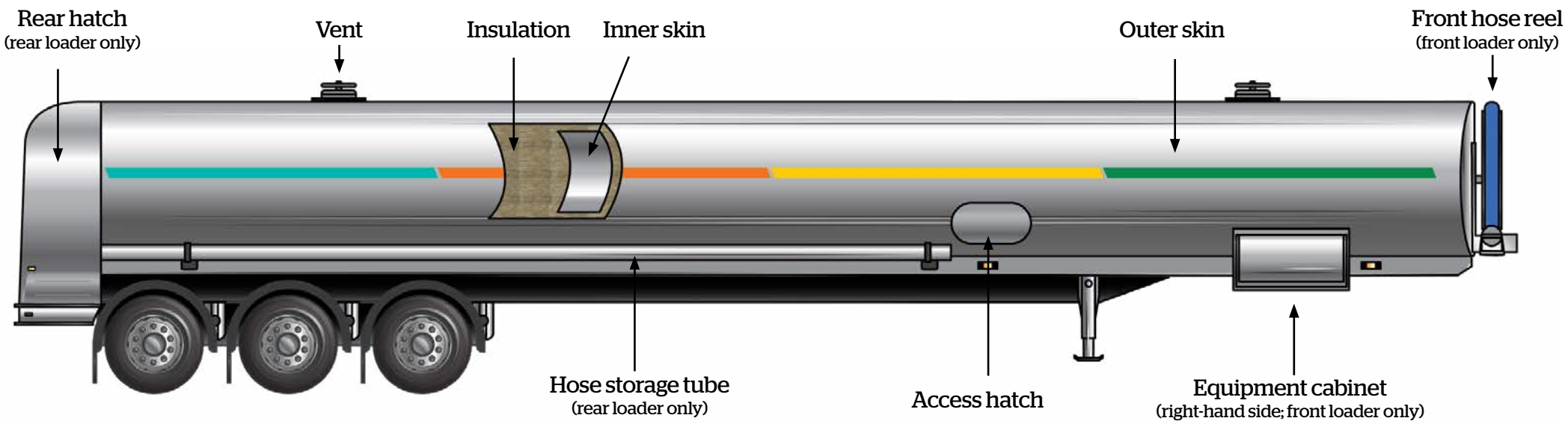


TANKER COMPONENTS

At its most basic, a dairy tanker is a hygienic, insulated tanker equipped with the required filling, sampling and delivery functions for transporting bulk milk between farms and processing facilities.

TANKER COMPONENTS

GENERAL LAYOUT



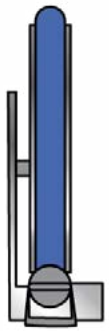
The detailed fit-out of pumps, metering equipment, sample storage etc. differs between trailers. It is important that personnel are trained on – and familiar with – the specific equipment they will be using.

HOSE REELS

Front loaders may feature a reel or sidewinder reel.

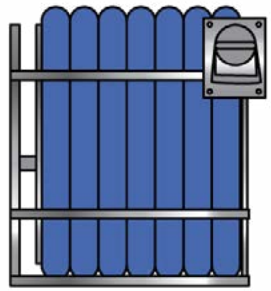
Reels may be oriented horizontally or vertically.

Vertical **reel**



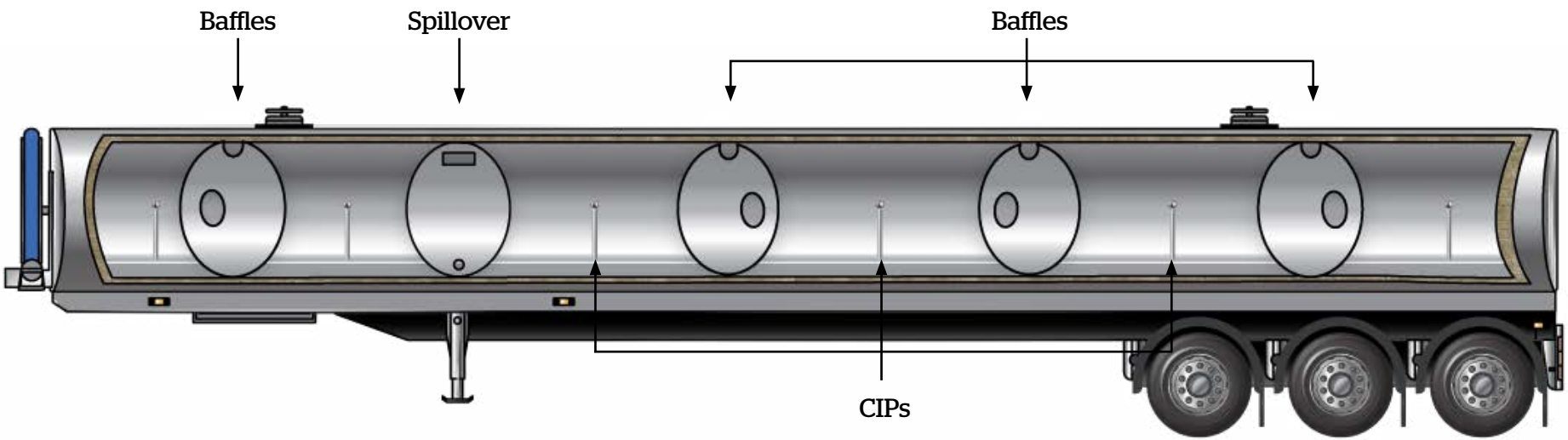
Horizontal **reel**

Horizontal **sidewinder reel**



TANKER COMPONENTS

INTERIOR LAYOUT



CLEAN IN PLACE (CIP)

The CIP system is an integrated internal cleaning mechanism.

It uses water and a caustic wash at high temperatures to clean tankers and meet food hygiene requirements.

CIP spray ball

Caution: The inside of tankers are a confined space and require specific training and safety precautions before they can be entered.

The risk is real and experienced workers have died.

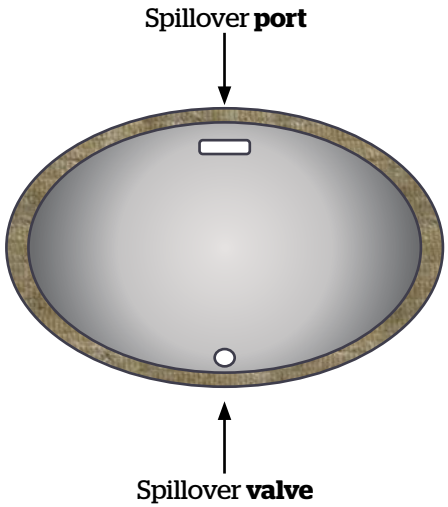
***Do not* enter a tank unless you are qualified, authorised and have followed all applicable processes.**

Caution: The CIP process involves elevated temperatures and caustic solutions. Ensure you are appropriately trained and follow appropriate processes at all times. Be safe, get home safe.

TANKER COMPONENTS

BAFFLES

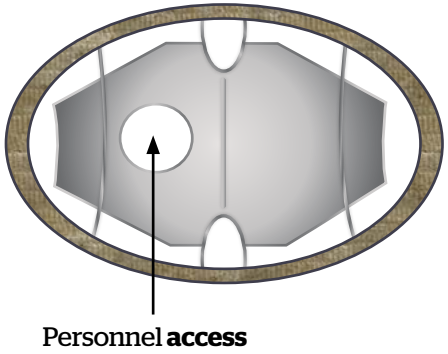
SPILLOVER



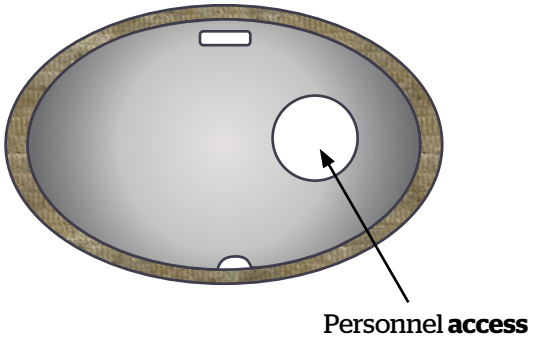
Creates a compartment at the front of the tanker that fills first, keeping milk and weight forwards.

This reduces surge, improves vehicle dynamics and ensures sufficient weight on the drive axles for traction.

PIN-MOUNTED BAFFLE



FULLY-WELDED BAFFLE



Baffles impede the flow of milk within a compartment, reducing surge and improving stability.

CAUTION!
Pin-mounted baffles are less effective at reducing surge.

Take care when changing between tankers with fully-welded baffles and tankers with pin-mounted baffles.

FULLY-WELDED BAFFLES are significantly more effective at reducing surge.

They are now standard on all new equipment from both Australian dairy tanker manufacturers.

TANKER COMPONENTS

COUPLINGS

KOMPENSATOR

Allows the units in a combination to roll relative to each other but with the roll axis offset upwards to be closer to the centre of gravity.

Tanker trailers are torsionally stiff due to their shape, so, unlike many other trailer types, they can't flex to follow the road surface. The Kompensator allows roll movement, reducing the chance of cracking.

BALL RACE

A ball race allows the fifth wheel to rotate, keeping it and its pivots aligned with the trailer.

By keeping the pivoting section of the fifth wheel aligned with the trailer, the coupling is able to absorb differences in the units' angles due to road geometry. This reduces stress in trailers and the likelihood of fatigue cracking.

TANKER COMPONENTS

STABILITY CONTROL

ELECTRONIC STABILITY CONTROL (ESC) SYSTEMS

WHAT

Electronic stability control (ESC) may also be called:

- Trailer stability control (TSC)
- Roll stability control (RSC)
- A vehicle stability function (VSF)

ESC systems use arrays of sensors to detect when a unit is at risk of rolling over. They then use the unit's braking system to intervene and try to prevent a rollover.

WHY

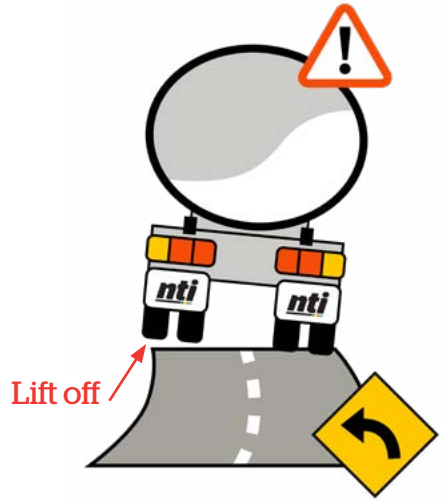
Where ESC is fitted and *functioning*, it greatly reduces the likelihood of a rollover event. However, it should never be fully relied upon and in some cases a rollover may still occur.

Operators can track an ESC system's interventions. Frequent interventions are a leading indicator that a given driver, corner, route or combination may have a higher risk of rollover crashes, allowing intervention *before* a crash occurs.

ELECTRONIC STABILITY CONTROL (ESC) INTERVENTIONS

Where the ESC function detects high lateral forces which may indicate risk of rollover, a **level 1** intervention is triggered

In a level 1 intervention the system applies the brakes lightly, taking up any free play in the braking system. Wheel speed is then monitored.



After a level 1 intervention, if the ESC system detects wheel speed rapidly slowing or stopped (indicating tyres losing contact with the road), it triggers a **level 2** intervention.

With a level 2 intervention, the system aggressively modulates the brakes, particularly on the outer, laden side to stabilise the vehicle and help prevent a rollover

COMMON TANKER COMBINATIONS

The following pages describe the dairy industry's most commonly used tanker combinations.

COMMON TANKER COMBINATIONS

RIGID & DOG

19m General access truck and dog

Length: 19m

Payload: 34,000L

Swept Path: 5.4m

20m PBS truck and quin dog

Length: 20m

Payload: 39,000L

Swept Path: 5.5m

May drop dog trailer for sites with poor access

The Performance Based Standards (PBS) scheme has seen rigid trucks with dog trailers make a resurgence in farm milk pick-up. This resurgence has been driven by payload and swept path performance, making them an efficient option for properties with more restricted vehicle access.

COMMON TANKER COMBINATIONS

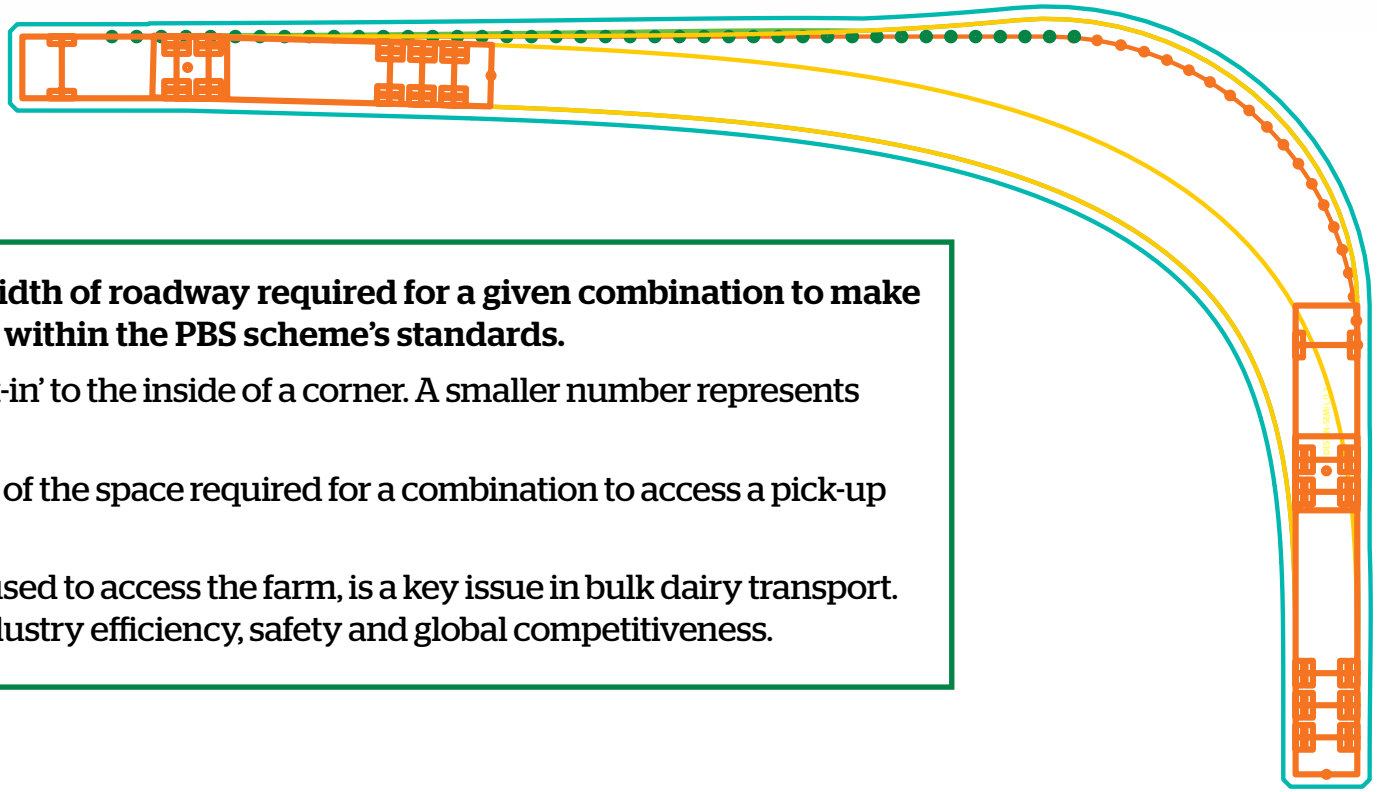
SEMI-TRAILER

Tri-axle semi-trailer

Length: 19m

Payload: 28,500L

Swept Path: 5.7m



SWEPT PATH

Swept path is a measure of the total width of roadway required for a given combination to make a standard 90-degree turn, as defined within the PBS scheme's standards.

It compares the amount that trailers 'cut-in' to the inside of a corner. A smaller number represents a better-performing combination.

This can be used as a general indication of the space required for a combination to access a pick-up or delivery site.

Access, both on-farm and on the roads used to access the farm, is a key issue in bulk dairy transport. Improving access enables improved industry efficiency, safety and global competitiveness.

COMMON TANKER COMBINATIONS

B-DOUBLE

19m 'pocket' B-double

Length: 19m
Payload: 34,000L
Swept Path: 6.7m

26m B-double

Length: 26m
Payload: 44,500L
Swept Path: 8.7m

While 26m B-doubles remain relatively common, they've been largely superseded for farm pick-up work by 26m PBS A-double combinations.

These A-doubles offer greater payload, better swept path, lower road damage when manoeuvring, better tyre wear and greater operational flexibility (as they can drop the rear trailer and its dolly).

COMMON TANKER COMBINATIONS

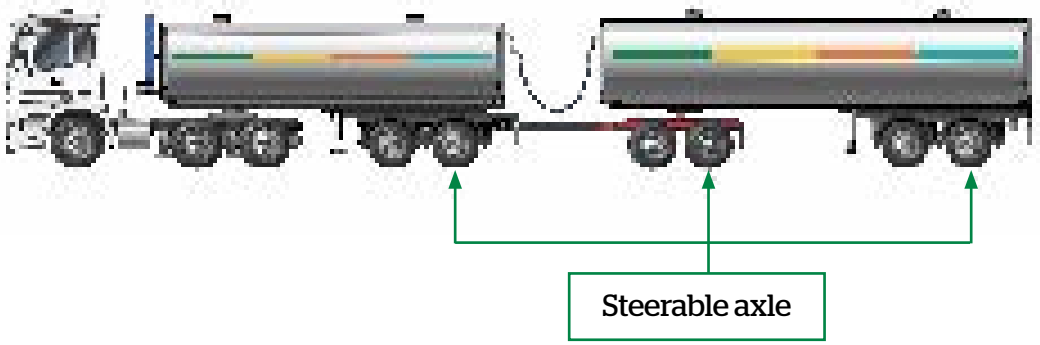
A-DOUBLE

26m A-double 2-2-2

Length: 26m

Payload: 48,500L

Swept Path: 6.3m

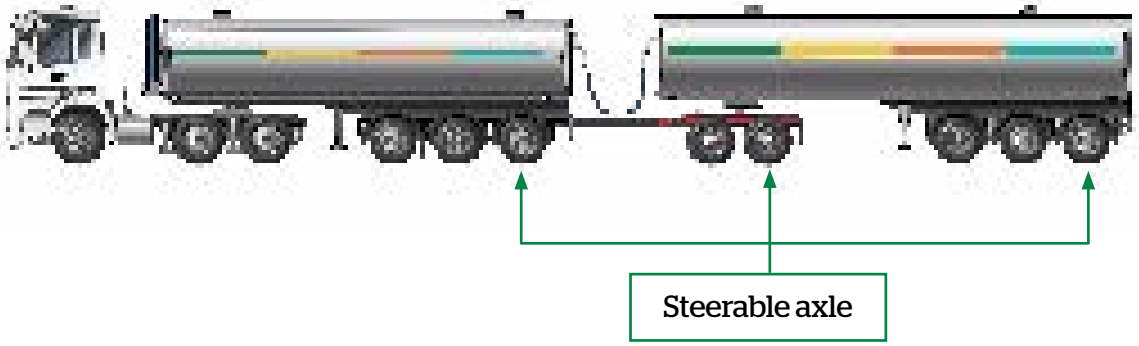


26m A-double 3-2-3

Length: 26m

Payload: 58,000L

Swept Path: 6.4m



30m A-double

Length: 30m

Payload: 58,500L

Swept Path: 7.5m

Typically used for inter-facility transfers

COMMON TANKER COMBINATIONS

AB-TRIPLE

36.5m AB-triple

Length: 36.5m

Payload: 71,500L

Swept Path: 10.6m

May also be configured as a BA-triple, with similar general performance characteristics. For more information on decoding large combinations see NTI's 'Trucking Basics' book

The dairy industry has seen significant consolidation over recent years. As dairy production becomes less widely distributed, the need to transfer milk long distances has increased.

AB-triples and other large multi-combinations can meet these long-distance transfer requirements with greater productivity and therefore reduced cost, less environmental impact and better safety outcomes.

TANKER DYNAMICS

Milk tanker dynamics are the key difference between milk haulage and other transport tasks.

This difference is due to milk 'slosh,' which is influenced by tankers' construction and baffles, and liquid milk's physical properties.

Risks from slosh are greatest when the front compartment is full and the remainder of the tanker around half full (41–70%).

The load has raised its centre of gravity, plenty of room to slosh and enough mass to impact vehicle handling strongly.

On less-than-perfect roads, especially early or late in the day, risks are heightened and rollovers become much more likely.

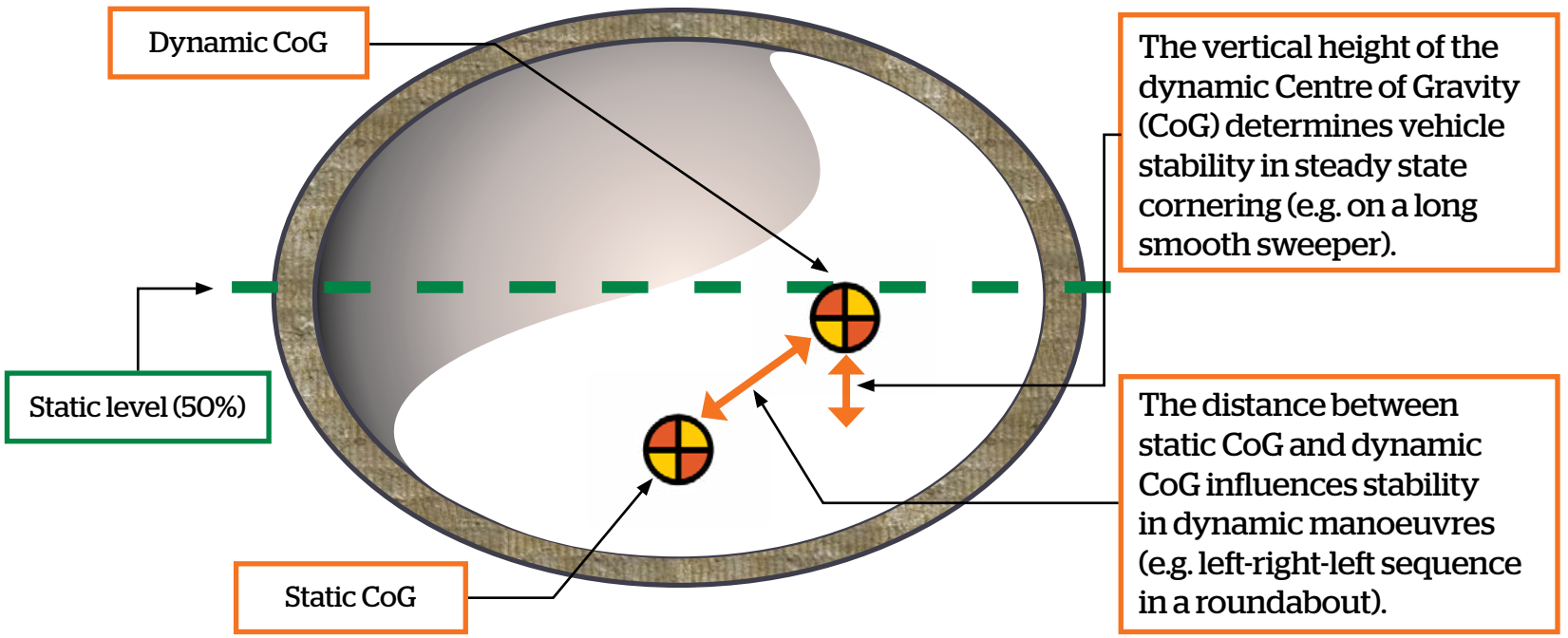
TANKER DYNAMICS

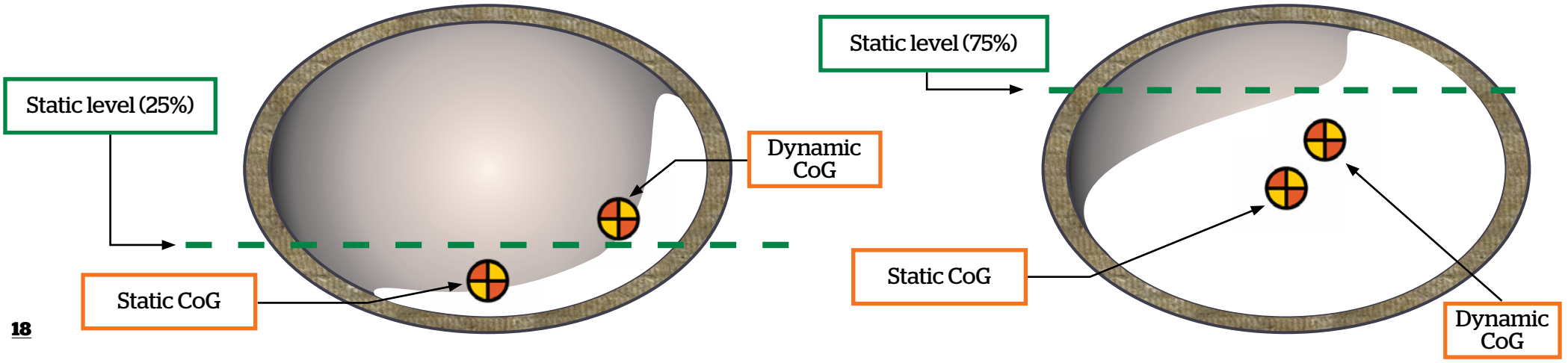
SLOSH

As a loaded dairy tanker turns, centrifugal force acts on the milk, pushing it up onto the tanker's wall.

This motion is 'slosh' and it changes a trailer's centre of gravity (CoG).

Specifically, it raises the CoG and balance point, making the trailer more likely to roll.





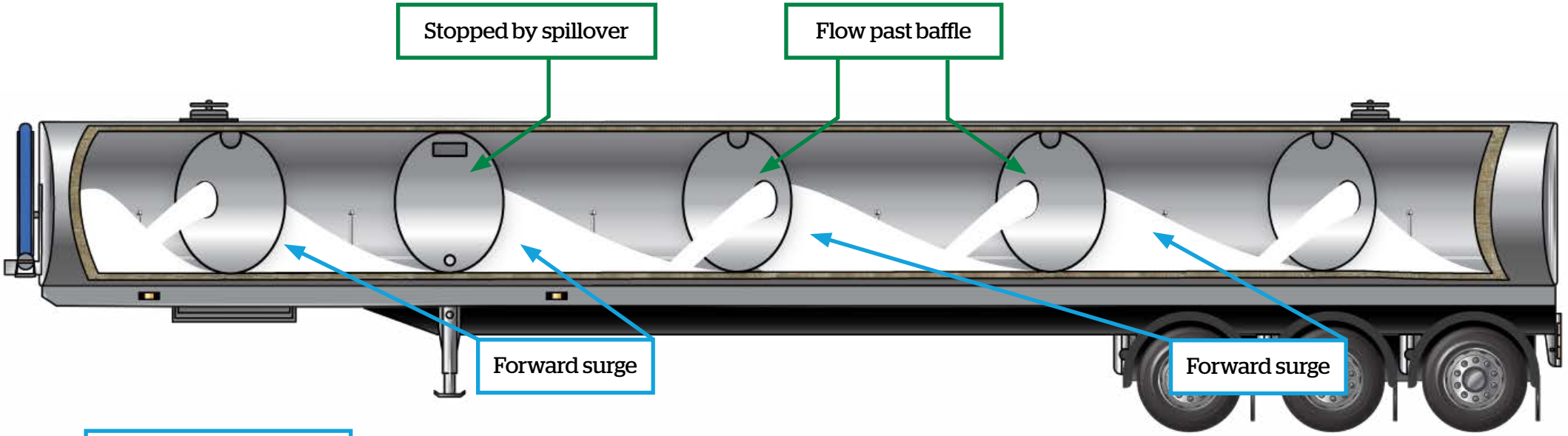
TANKER DYNAMICS

SURGE

As a milk tanker combination brakes and accelerates, the milk surges towards the tanker's front (braking) or rear (acceleration).

This surge generates additional force and can increase the risk of sliding, especially under braking.

Particular care must be taken on hills, when cresting (forward surge) or climbing (backwards surge).



Direction of surge

Under **braking**, milk surges **forward**.

Under **acceleration**, milk surges **back**.

TANKER DYNAMICS

LOADING AND RISKS

1.

Spillover (9 to 10 kL) full, main compartment empty:

- Mass forwards and contained
- Good stability
- Lowest risk

2.

Spillover full plus 1–40% of main compartment:

- High mobility
- Low CoG
- Moderate risk

3.

Spillover full plus 41%–70% of main compartment:

- High mobility
- High CoG
- Highest risk

4.

Spillover full plus 71%+ of main compartment:

- Low mobility
- High CoG
- Moderate risk

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