



# Bulk Silo & Tanks

Industrial Silo Hopper And Tank Solutions For Powders And Granular Materials



Bulk Silo & Tanks

Bradwood Packaging & Packaging Machinery Offers Complete Filling, Packaging & Weighing Solutions



## Bulk Storage Silos & Tanks

### Bulk Silos & Tanks

Bradwood Packaging & Packaging Machinery guarantees our solutions and products. From our 30 years experience manufacturing Bulk Silos & Tanks, we're able to customise a solution that suits your process, rather than forcing our equipment to suit your process.

Our Bulk Silo & Tank systems use world's best practice for design, manufacturing and installation.

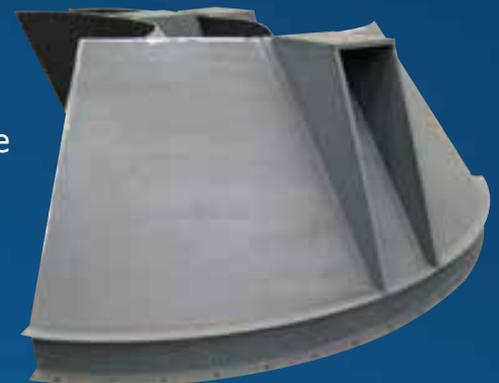
At Bradwood Packaging & Packaging Machinery it does not matter what size, capacity or shape of silo or tank you need, if we don't have an existing design we can draft a custom solution to suit your needs. Bradwood Packaging & Packaging Machinery can manufacture to suit varying heights, capacities, widths, inlet and outlets, complete with breakers, dust collectors, level controls, associated piping, special valving and over a hundred other available options.

Bradwood Packaging & Packaging Machinery build machinery to comply with Australian and International Standards. Safety is a critical issue, so when supplying any system a full risk assessment is carried out. All our systems are engineered and

supported by written documentation so you can rest easy.

Bradwood Packaging & Packaging Machinery systems go beyond simple bulk storage silos by providing additional componentry to build a complete materials handling solution from start to finish.

Other products in our range include bulk bag fillers / emptiers, storage bins and hoppers, rotary valves, mixers, diverter valves, bin activation, augers, mechanical & pneumatic conveyors, bucket elevators, batch weighers, level controls, and packaging machinery. Please see our videos on all of our bulk materials range as well as our turn key plant solutions.



Section Of Silo Ready For Assembly

**Bradwood Packaging & Packaging Machinery Offers Complete Filling, Packaging & Weighing Solutions**

## Your Bulk Silo & Tanks Are Built to Last



Undergoing The Painting Process



Bottom Cone Of Silo Under Construction



Silo ready for shipping



Welding Of Silos

**Bradwood Packaging & Packaging Machinery has a system to suit your requirements, from silos to tanks, conveying equipment or complete solutions. When you think of packaging & materials handling, think of Bradwood Packaging & Packaging Machinery.**

Bradwood Packaging & Packaging Machinery has extensive experience in designing and fabricating Industrial Silos, Tanks and materials handling processes, You'll find from concept to installation, our 30 years of experience will help you in fleshing out a working design which may be manufactured and installed on your site.

With over 30 years experience we have learnt that one size does not fit all, (not even close). Rarely does an out of the box solution fit all applications so every Silo/Tank or system is customised to your requirements. So don't hesitate to ask if your product line is different or difficult because customisation is the "Norm" at Bradwood Packaging & Packaging Machinery.

To make sure you get the right equipment for your job, consideration needs to be given to the type of product being processed, Properties like bulk density, abrasiveness, angle of repose, ignition energy, and the general ability for your product to flow are assessed, along with hardware features like types of fittings, capacity, special requirements, material finish, material to be used and so on. So talk to Bradwood Packaging & Packaging Machinery so your tanks and silos are design and constructed to fit your specific purpose.

Your factory usually is the major constraint, the area and size of your work space usually dictates the physical dimensions of the equipment we need to manufacture.

If your area for your silo or tank is too small or has to fit into a confined area, then our team will provide custom on site fabrication and installation to meet your needs.

We also have designs that allow silos that are too large for transportation to be assembled using modular bolted sections or we have a solution that sees your silo welded on site using rolled sections.

One factor that needs to be considered in the decision making process is the transportation of silos. They may need to be manufactured on site if the diameter of the silo is greater than 3.5 m because the cost of transportation is expensive. Diameters up to 4.3 metres are able to be transported on low loading decks but overall height to ground must be kept to 4.8m maximum from ground level otherwise there are additional costs in lifting power lines.

That said, at greater expense, and with more "red tape" you can transport a silo where the loaded height above the ground is greater than 4.8 metres but you will need "deep pockets" for this.



## A Guide To Help You Select the Right Silo/Tank Manufacturer



Section Of Bolted Carbon Steel Tanks



Cone Section Outlet



Silo Cone Under Construction



Waterboard Hydrated Lime Silo

**When choosing a dry bulk storage system you need to consider several key issues such as quality of the tank material, suitability of the tank material for the product to be stored, price of the tank and construction type.**

### Structure:

Silos & tanks can be made from (carbon steel, stainless steel and glass-lined steel), either by factory or on-site welding. They can also be made of fibreglass and concrete.

Bradwood Packaging & Packaging Machinery specialises in stainless steel and mild steel tanks and offer factory welded, bolted steel & onsite welded tanks.

- ▶ **Bolted Carbon Steel Tanks** are excellent choices for larger jobs due to their quick installation and can also have a corrosion resistant epoxy coating added. They also have the benefit of being able to be disassembled and moved to another location. They also may be installed without highly skilled labour, with only a supervisor to guide the installation.
- ▶ **On site Welded Steel Tanks** are notable for their ability to hold very large volumes of product. Bradwood Packaging & Packaging Machinery offers onsite welded tanks up to 300 cubic metres in size. Size is largely determined by the site real estate and factory access. These factors typically determine whether your silos and tanks are pre manufactured in our workshops or how much site fabrication is required. Site fabrication is a last resort because costs are typically much higher due to materials handling and resource issues.
- ▶ **Factory Welded Tanks** are generally smaller in volume. They are fabricated in the factory and are shipped ready to connect when they arrive on your site.

**It's wise to consider companies which offer a complete bulk storage and handling solution. This ensures each component works together rather than trying to cobble together some adhoc pieces of equipment and solve compatibility issues on the fly.**

## What To Look For In Tank Manufacturer



Manufacturing A Set Of Silos



A Welded Bottom Cone



Painted Silo Being Loaded On A truck



Tank With Packaging Machine

- ▶ Does your tank Supplier manufacture to Australian Standards? You should recognise the differences between imported or back yard operators and a company committed to the International Standards for Welded Tanks?
- ▶ Are their boilermakers qualified? You need qualified tradesman laying down quality welds and having a commitment to the project.
- ▶ It's easy to cut corners trying save a dollar by not paying attention to specifications, material thickness, welding procedures, coatings, etc.
- ▶ You may think you're saving money by choosing the cheapest contractor, but if it fails because of poor workmanship or materials this could produce disastrous results. Make sure your supplier is around to honour you warranty concerns.
- ▶ Be an informed and an aware consumer buy on the underlying specification. A trap to watch out for is specifications written around a specific manufacturer, with an underlying endorsement by their consulting engineers. The specification will call up a 'unique' types of coating, use of 'special' gaskets or other intangibles that don't necessary add any value to your bulk handling system. This is done in an attempt to disqualify any competition and it will probably impact your bottom line.

These are some of the factors that will determine the longevity and suitability of the tank for a specific bulk storage application. A bad decision or cutting corners can produce disastrous results.



### Some Guidelines To Follow When Choosing A Silo/Tank Are:



Welding Of A Silo



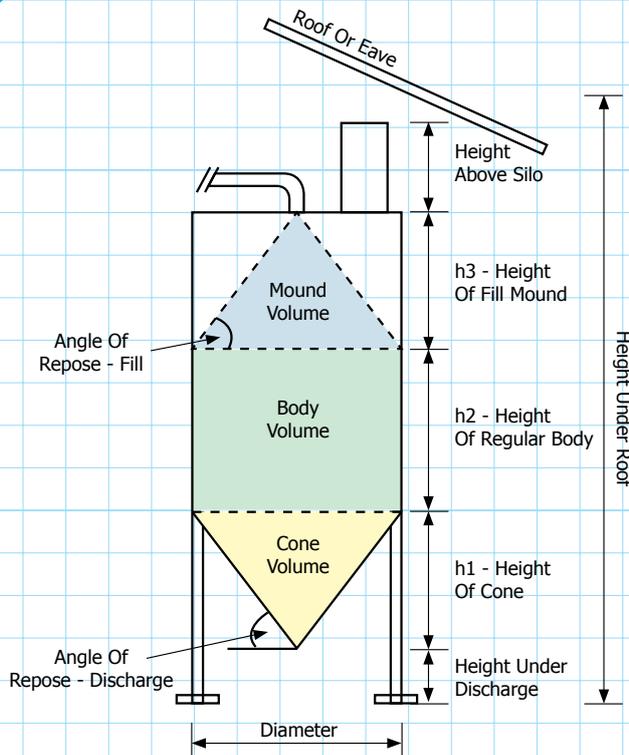
Preparation Of Strake On A Silo



Welded Silo ready for painting

- ▶ Make sure your tank system is specifically fabricated to your projects application and you obtain as many quotations as possible from reputable companies.
- ▶ If your project requires more than tanks, it is better to deal with companies that can supply a complete package. Thus ensuring all the parts of the jigsaw fit together, your tanks, conveying system or other materials handling equipment being supplied will integrate into your existing system or satisfy your new requirements.
- ▶ Consider who wrote the specifications you're following. Do they have a bias for a preferred system? Are they providing you with all the technical options and pricing?
- ▶ Always make sure the offers you receive provides you with individual elements of the tank design, including plate thicknesses, coatings, welding methods and the certainty that the tank or silo offered is suited to your specific needs.
- ▶ If you are acquiring a field welded or field installed bolted tank ensure the tank provider has a valid construction license, adequate insurance cover and safety certifications.
- ▶ Obtain a written guarantee of the lifespan of the tank and other accessories and integrated components for your overall system.
- ▶ If you receive competitive bids, be sure to compare like with like and as time is usually of the essence - investigate the installation methods that are to be employed. For example our tank jacking system allows the tank to be installed without the use of cranes and scaffolding. This is a faster and safer system and enables tanks and silos to be installed in areas where space is critical.
- ▶ When looking at price, don't be tempted to opt for the cheaper product without first investigating if the lower price is due to the use of cheaper materials and inferior construction methods.
- ▶ If you're looking for a traditional tank, silo or looking at the fast growing RTP-Rolled tapered panel bolted tank or silo, then make sure they can deliver on these guidelines.
- ▶ By following these guidelines your tank fabricator will supply a tank that should have a lifespan of more than 40+ years and will be an integral and reliable part of your bulk storage and materials handling system.
- ▶ If your looking for a fabricator to design, manufacture and install your tanks then talk to Bradwood Packaging & Packaging Machinery because our silos and tanks are highly competitive and we build them to last.

## Determining Your Minimum Silo Or Tank Capacity



### TYPICAL MATERIAL PROPERTIES

Raw Material	Bulk Density (Tonnes/M3)	Angle of Repose (O)
Coffee, green	0.7	35-45
Flour	0.6	45
Lime, hydrated	0.5	45
Sand, dry	1.6	34
wheat	0.8	28

Ask for our comprehensive table of bulk densities  
 Note that Bulk density is not an intrinsic property of a material; it can change depending on how the material is handled. This table is reliable providing we allow a margin for error.

**“Big is better”** when it comes to determining the storage requirements of your raw materials. Of course, the extension is that BIG costs more, and BIG won't fit in the available space. Optimised silo capacity needs to consider the following..

- ▶ **What is the capacity of my bulk raw material delivery vehicle?**  
 You must be able to fit at least 1 truck load of raw material into your silo each time you order a new load.
- ▶ **What is the output of my plant in tonnes/hr and what is the worst case usage of this raw material?**  
 So if your recipe uses 50% of this raw material per batch and you manufacturer at 6 tonnes per hour, you require 3 tonnes per hour of this material.
- ▶ **When will your plant manufacture?**  
 Consider here if you run 24/7 or 8 hour/day for 5 days.
- ▶ **When I call, how long will the supplier take to deliver the raw material.**

First, you should only call the raw material supplier when you can fit at least 1 load in your silo. You need the full load in your silo.

Second, the volume of product left in your silo needs to support production until your next delivery.

e.g. You can calculate your raw material requirement based on 24 hour response by your supplier. A 10 hour production schedule using 3 tonne/hour of this material and 24 hours to supply, will need  $10 \times 3 = 30$  tonnes of material.

- ▶ **Your silo must hold 1 truck load plus production requirement until next delivery.**

Assuming each truck delivery is 32 tonne, from our example, your silo must hold  $32 + 30 = 62$  tonnes.



## Bulk Storage Silos & Tanks

### Determining Your Minimum Silo Or Tank Capacity

#### What is the average bulk density of this raw material?

The silo capacity must be converted to a volume (from a weight). To calculate the volume of the silo we multiply the weight by the raw material bulk density. Assuming our raw material is sand, we can determine at a bulk density of 1.6 (see table) that the volume needed to store 62 tonnes is  $1.6 \times 62 = 99.2$  cubic metres. The bulk density may be calculated by weighing a sample of your raw material and determining geometrically what volume it occupied. We can assist with this calculation.

#### What is the angle of repose for your raw material?

This is the angle or slope formed when the product starts to flow. It is also the angle that we need on the cone of the silo so that all products will flow out of the silo. Many products have an angle of repose less than 45 degrees and by default our silos use 30 degrees for infeed and outfeed calculations. We can calculate the approximate angle of repose using the Tilting Box Method that places the material within a box with a transparent side. It should initially be level and parallel to the base of the box. The box is slowly tilted at a rate of approximately 1/2 degree/second. Tilting is stopped when the material begins to slide in bulk, and the angle of the tilt is measured.



## Determining Your Minimum Silo Or Tank Capacity

### Are there any other constraints?

Perhaps the discharge outlet needs to be above your down-stream process to allow gravity feed, or there is a dust collector and walkway on the top of the silo. Certainly the height of your factory roof is a constraint, and our most economical tanks have transport constraints of 3.5 metres diameter. Try to identify any conditions on the silo design that will limit its height or diameter.

To demonstrate the typical silo sizing process we will work through the calculations for a simplified cylindrical silo with conical bottom.

The silo capacity is 100 m<sup>3</sup>.

- ▶ The angle of repose is assumed to be 45°
- ▶ The ceiling height is 20 metres.
- ▶ The clearance under the discharge is 0.5 metre
- ▶ The infeed and dust collector needs 2m with a service factor
- ▶ The diameter is 3 metres (suggested)

**The discharge angle of repose – the CONE** is based on the angle of repose of your product or in this case 45 degrees.

**Cone Volume =  $\frac{1}{3}\pi r^2 \times h_1$**  where r is the silo radius and h<sub>1</sub> is the height of the cone.

**H<sub>1</sub> = r = 1.5m** for angle of repose = 45°

The capacity of the cone is 3.5 m<sup>3</sup>

**The filling angle of repose – the MOUND** Is also based on the angle of repose of your product or in this case 45 degrees fed from centre.

**Mound volume =  $\frac{1}{3}\pi r^2 \times h_3$**  where r is the silo radius and h<sub>3</sub> is the height of the mound. **H<sub>3</sub> = r = 1.5m** for angle of repose = 45°

The capacity of the mound is 3.5 m<sup>3</sup>

**The straight walled section – the BODY** The body of the silo is a regular cylinder where the product will fill the volume. (does not include the filling mound)

**Body Volume =  $\pi r^2 \times h_2$**  If r is the silo radius and h<sub>2</sub> is the height of the straight sided cylinder.

Also,

**Body capacity = Silo capacity - mound capacity - cone capacity**

Body capacity is 100 - 3.5 - 3.5 = 93m<sup>3</sup>



## Bulk Storage Silos & Tanks

### Determining Your Minimum Silo Or Tank Capacity

**Body height(h2) = body volume /  $\pi r^2$**

If r is the silo radius and h2 is the height of the straight sided cylinder.

Body height is 13 metres

#### The final geometry

This silo has the following vital statistics

Capacity (m3)	100
Silo diameter (m)	3
Height Under Cone (m)	0.5
Height of Cone (m)	1.5
Height Above Cone (m)	13
Total Silo Height (m)	15
Height Above Silo (m)	2
Height Under Roof (m)	20



# Bulk Storage Silos & Tanks Data Sheet



**Bradwood Packaging  
Australian Weighing Equipment**

Sydney + 61 2 8717 3333  
Melbourne + 61 3 9330 1011  
Brisbane + 61 7 3423 1388

**INQUIRY FORM**

- Firm Quote
- Budget Quote

Date: \_\_\_\_\_  
Quotation Due Date: \_\_\_\_\_  
Name: \_\_\_\_\_  
Company: \_\_\_\_\_  
Phone: \_\_\_\_\_  
Job Reference: \_\_\_\_\_  
QUOTE TO: \_\_\_\_\_  
\_\_\_\_\_  
Phone: \_\_\_\_\_  
Fax: \_\_\_\_\_

**NOTE**  
**If there are any  
Special Fabrication,  
Structure,  
Engineering  
or Testing  
Requirements,  
Please Attach Data  
to This Sheet**

<b>Silo Data</b>	Internal Pressure		<b>Material Characteristics</b>
	Vacuum Rating		
	Quantity		<input type="checkbox"/> Free Flowing <input type="checkbox"/> Abrasive
	Capacity		<input type="checkbox"/> Corrosive <input type="checkbox"/> Exposive
	Constructed	<input type="checkbox"/> Carbon Steel <input type="checkbox"/> Aluminium <input type="checkbox"/> Stainless (316)	<b>Support Style</b>
	<input type="checkbox"/> Usable <input type="checkbox"/> Chocked		<input type="checkbox"/> Structural Legs (4) <input type="checkbox"/> Short Skirt <input type="checkbox"/> Additional Legs <input type="checkbox"/> Full Skirt <input type="checkbox"/> Structure to be quoted <input type="checkbox"/> Structures by others
	Seismic Zone		<b>Material Data</b>
	Installation Site		<input type="checkbox"/> Dry <input type="checkbox"/> Granular
Inside / Outside		Material to be stored _____	
Wind Velocity		Bulk Density _____ t/m <sup>3</sup>	
QTY	SIZE		Angle of Repose _____
<b>Vent</b>			Coefficient of Friction _____ (30° STD)
_____	_____ "	<input type="checkbox"/> Square Bin Vent Flange _____ # <input type="checkbox"/> Round Bin Vent Flange _____ #	
<b>Access</b>			
_____	_____ "	DIA. MW/PVR	
_____	_____ "	DIA. Centre Dome with Cover Plate	
_____	_____ "	DIA. Manway	
		<input type="checkbox"/> Deck <input type="checkbox"/> SW <input type="checkbox"/> Hopper	
<b>Fill</b>			
_____	Sub Nozzles Sizes _____		
_____	Fill Line Brackets, Size _____		
<b>Level Indicators</b>			
_____	Types _____ Sizes _____		
<b>Safety Equipment</b>			
_____	Handrails _____	Ladder _____	
	Crossover _____	Length _____	
	(Ladder Rest Platform)		
<b>Other</b>			
_____	Flange Nozzles _____		
_____	Shop Mount Bin Activator		
<b>Finish</b>	<b>Interior</b>	<b>Exterior</b>	
Weld Interior	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Grind Smooth	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Plain (Uncoated/Std)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Epoxy Primer	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Polyurethane	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Top Coat Colour: White is standard. If paint is another colour, then note below.



## Bulk Storage Silos & Tanks

### Who is Australian Weighing Equipment & Bradwood Packaging

Jeff & Trevor Baillie started AWE in 1981, focusing on weighing solutions based on engineering principles. For the last 30 years AWE has built its reputation as a leading supplier of robust Packaging & Bulk Handling Equipment. Our innovative engineering, and continuous product improvement have led to designs that will stand up to the rigours and demands your product line will throw at it.

Bradwood Packaging's bulk handling & packaging equipment can reduce or eliminate the need to manually perform repetitive tasks of filling, packaging and palletising.

We know that one size does not fit all. If our 'Out-of-the-box' equipment does not suit your needs, then talk to us about a custom solution. We are ready & able to engineer a cost effective design based on our 30+ years experience.

The biggest compliment we hear is, "Your packaging equipment is Over-Engineered". Our response: "Bradwood Packaging knows most packaging equipment operates in a harsh environment. They cop a pounding".

We must engineer to survive these conditions. Bradwood Packaging understands our reputation depends on this. So we prefer to build our packaging equipment based on our experience to anticipate and cope with the harsh conditions of factory life.

Bradwood Packaging's bulk handling & packaging equipment is built to "Our Standards" to Protect Your Investment.

Based on this experience, we're constantly called in, to consult on setting up product lines, tailored to suit unique packaging and bulk handling applications.

### AWE Investment in the Future

To help provide a seamless packaging solution, AWE has just increased its investment in our manufacturing facilities now giving us over 3,200 square metres of factory in Sydney with

- ▶ A CNC Machine Shop
- ▶ Heavy Metal Fabrication Shop
- ▶ Plus further room for our team of qualified tradesman

Acquisitions of Bradwood Packaging, Dendy Packaging and Design Engineering increased our packaging and engineering experience.

In 2008, AWE established a manufacturing facility in China - Bradwood Packaging and Bulk Materials Handling Equipment.

Bradwood Packaging and Bulk Materials Handling Equipment, currently occupies a purpose built 2,300m<sup>2</sup> factory in Suzhou China (70kms From Shanghai).

All Equipment is Australian designed and manufactured under Bradwood Packaging's strict quality control system in our own factories both locally and internationally.

## Bradwood Packaging Offers Complete Filling, Packaging &amp; Weighing Solutions

## Bradwood Packaging Guarantee

Bradwood Packaging supply and backup what they sell - That's a Guarantee from the manufacturer. **The directors stand by all the equipment sold by Bradwood Packaging, if it's not suitable, or doesn't work, then we will fix it, replace it or you don't pay.**

To deliver on our commitment of providing quality, reliable packaging and bulk handling equipment, Bradwood Packaging understands it's more than just delivering a well built & designed packaging machine. It also requires a team of dedicated people who care and are there to back you up with great Service & Support.

The quality of our team sets us apart. Most companies choose to outsource these services to contractors, or buy machinery from overseas as a so called agent. They do not have the knowledge base to support or maintain this equipment long term.

Bradwood Packaging's solutions are designed to fit your factory systems, to do this requires a team of professionally trained tradesmen.

When Bradwood Packaging starts building your equipment, an army of skilled tradesmen engineers, draftsmen are on the job.

## We're Talking About

- ▶ Licensed Tradesmen
- ▶ Mechanical Engineers
- ▶ Electrical Engineers
- ▶ Structural Engineers
- ▶ Draftsmen
- ▶ Fitter & Turners
- ▶ Boilermakers
- ▶ Fully Qualified Scale Makers
- ▶ Electronic Technicians
- ▶ Instrument Fitters
- ▶ Electricians
- ▶ Service Technicians
- ▶ Project Managers
- ▶ Formworkers
- ▶ Concreters

They are all led by your own personal project manager assigned to make your project run smoothly. Which means there's one point of contact, you won't get the run around. They're responsible for managing the design team, installation, commissioning and documenting your project.

## Reliability

Bradwood Packaging's bulk materials handling and packaging equipment is designed for Australian conditions and a lifetime of heavy duty filling, bagging & packing. Our proven and robust designs are engineered and manufactured in-house to the highest standards to provide our customers with a lifetime of reliable and accurate service.

In the unlikely case of breakdown, we know downtime is costly and service is required, quickly with accurate attention.

**Bradwood Packaging's Service Technicians Are On Call 24/7 , Because We Know Breakdowns Don't Always Happen In Business Hours.**

The service guys are there when you need them. When your line goes down, 5.00pm on a Friday, you need technicians to turn up. If you need them at 11pm Saturday, they will be there. That's a promise, because we stand behind our equipment.

# So If You Have Questions About Factory Layout And Packaging Equipment, Bulk materials handling or componentry Then Talk To Bradwood Packaging & Packaging Machinery About Our Solutions

Bradwood Packaging & Packaging Machinery prides itself on providing plain english proposals, there's no hidden surprises. You'll know what you're getting.

Bradwood Packaging & Packaging Machinery manufactures filling, sealing to palletising lines, as well as designing complete plant lines.

So if you have questions about factory layout and packaging equipment, then talk to Bradwood Packaging & Packaging Machinery about our solutions.

Call or email us today and find out how our sales team and project engineers can assist you in finding the best Packing & Bagging solution for your needs.

## Companies in the AWE Group



Australian Weighing Equipment P/L



All State Machining



Rite-Weigh Scales P/L



Dendy Packaging (Australia)



Bradwood Packaging and Bulk Materials Handling Equipment

### Australian Weighing Equipment Sydney Office

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www.awe.com.au

### Bradwood Packaging P/L

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### Rite-Weigh Scales Brisbane Office

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Email: sales@rite-weigh.com.au

### Rite-Weigh Scales Melbourne Office

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Ph: (+61) 3 9330 1011  
Email: sales@rite-weigh.com.au



Visit AWE Group YouTube channel at [www.youtube.com/user/AustWeighing](http://www.youtube.com/user/AustWeighing) where you can watch videos, on our products and services in action. You'll see our new product releases On Industrial Weighing Systems, Packaging Machinery & Bulk Handling Solutions



Sydney



Melbourne



Brisbane

## Dealer's Information:

For Links to AWE Website please scan your smartphone here

