2025 APGA Innovation Award Nomination

SafeVac Lifting Systems™

Dipper Arm Vacuum Chamber Conversion

Vacuum Lifting Attachment Technology

Vacuum lifting technology is now a well-established pipe handling method known for its efficiency and safety benefits. It's primary benefits over the traditional method of slinging are:

- Increased speed in managing all pipe movements on projects including on site receipt of pipes, pipe movement on-site and in-trench placement of pipes, yielding both efficiency and safety outcomes for projects.
- Elimination of the need for personnel to be involved in slinging pipes which eradicates the primary risk to workers associated with heavy lifting operations and at the same time facilitates the use of worker exclusion zones.
- Elimination of damage to lifted pipe when chains and other restraints are used.
- Is easily adaptable for lifting objects and materials other than pipes such as steel plates, formed concrete and the like.

Over the last twenty or so years Vacuum Lifting attachment (VLA) manufacturers have arrived at different configurations to most efficiently handle pipes using vacuum as the lifting medium.
The general objective being to lift the heaviest weight with the smallest machine on the basis that smaller machine = better efficiency.
Vacuum is the medium by which the lift is made, and it is relatively easy to achieve the pressure differential necessary to lift weights considerably in excess of what the host machine and the VLA itself can safely lift.
In this technology it is the lifting limits of two elements that limit lift capability:

- The weakest link in the VLA components namely tank assembly, rotator spreader bar and shoes will determine maximum safe lift.
- The assessed SWL of the host machine itself . The VLA hardware may be rated to lift 10t but if the SWL of the host machine is only 5t that will determine the maximum lift.

In addition, manufacturers have needed to consider the way their VLA is set up as the weight of the components of the VLA itself will affect the SWL to a lesser or greater degree.
If all of the VLA components (tank assembly, rotator, spreader bar and shoes) are hanging off the end of the dipper arm the SWL will be further reduced by the combined weight
Hence the move to place some of that hardware (typically tank and pump assembly) to the back of the host machine which acts as a counterweight.

Austrack Equipment VLA Breakthrough

Austrack Equipment has designed and manufactured a vacuum pipe lifting system under the trade **name SafeVac Lifting Systems™.**

Their first model, the SV400 is designed and manufactured in Australia and carries the Australian made logo.

Technically these units fall under the description Vacuum Lifting Attachment (VLA) being designed as a lifting attachment for use with a mobile hydraulic excavator. The first SV400s rolled out in mid-2023. Their primary purpose is for the lifting, moving, and placing of pipes. The lifting source is pump generated vacuum.

In SafeVac Lifting System™ design the system is the result of close collaboration between experienced frontline pipeline professionals at Austrack Equipment who are well versed in the practicalities of pipelining, and specialist control system developers who address the complexities of machine automation and associated safety considerations.

The SV400 with the conventional spreader bar set up with dual shoes

The initial unit the **SV400,** is a VLA consisting of a rear mounted vacuum generation assembly, piped across the boom and dipper arms to the vacuum lifting end consisting of a spreader bar within which resides a vacuum tank or chamber and attached vacuum shoes which make a vacuum seal to enable items mostly pipes to be lifted.

Typically, this system is placed on tracked host excavators in the 35-to-50-ton size categories and are designed and rated to lift weights starting at about 3t with an upper limit determined to a large degree by the size of the host machine. The typical lifting capacity will be in the range 4t to 10t.


CERTIFICATE OF GRANT
STANDARD PATENT
PATENTS ACT 1990

In addition to having Australian Made certification the SV400 has been designed to be in full conformity with the latest **European Standard (EN13155, 2020).** EN13155 because of its more recent release is generally more onerous than the comparable **Australian Standard (AS4991, 2004)** which is currently under review. Accordingly, the SV400 is the most comprehensively integrated and the most highly specified control system of any currently available in Australia.

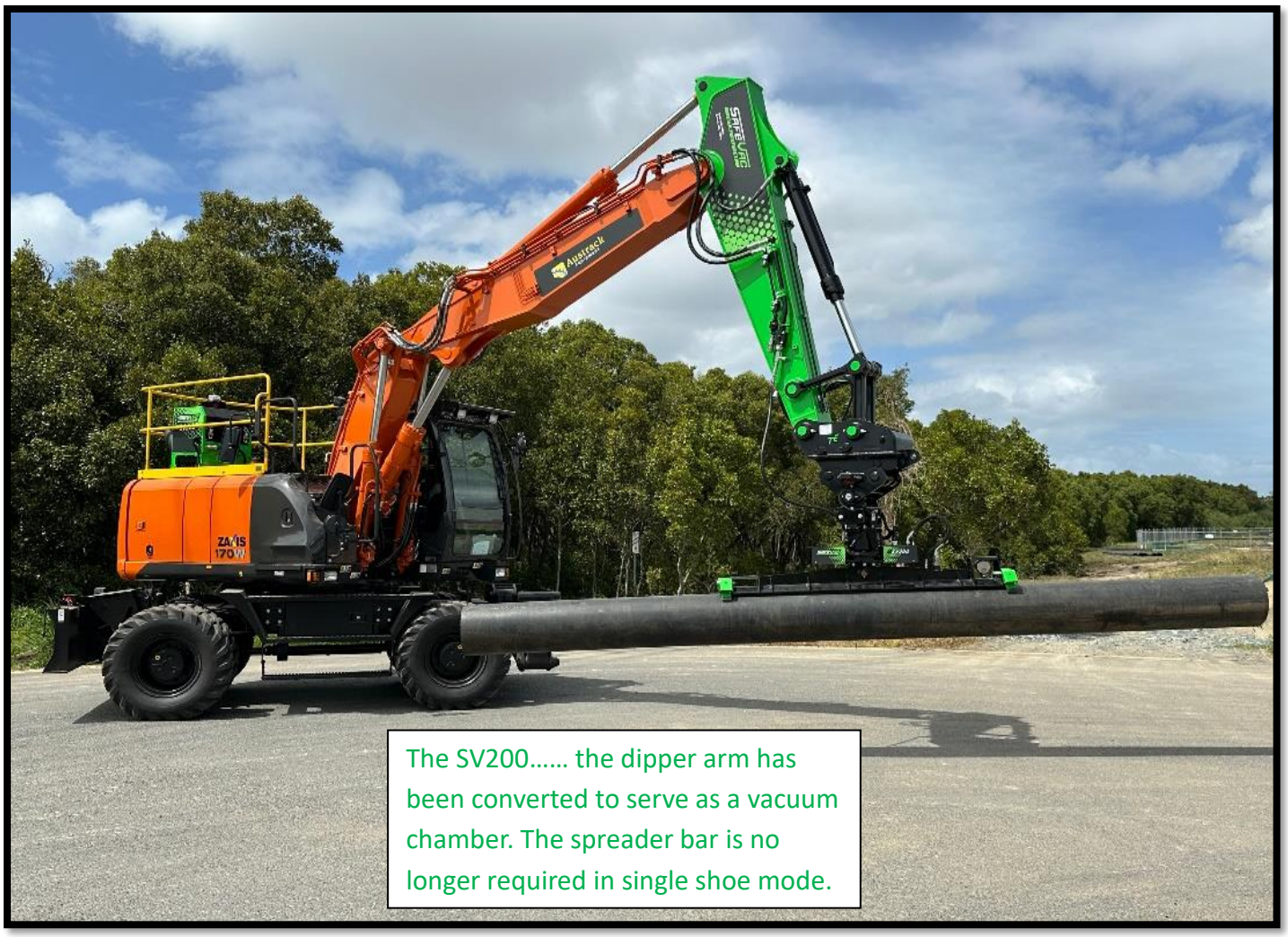
Apart from its Australian Made status and its conformance with applicable European Standards the SV400 also holds a **Patent Certificate of Grant No 2024203635** which recognises amongst other features the unique control system safety features which are unique to the SV400.

SafeVac SV200 joins the team late 2024

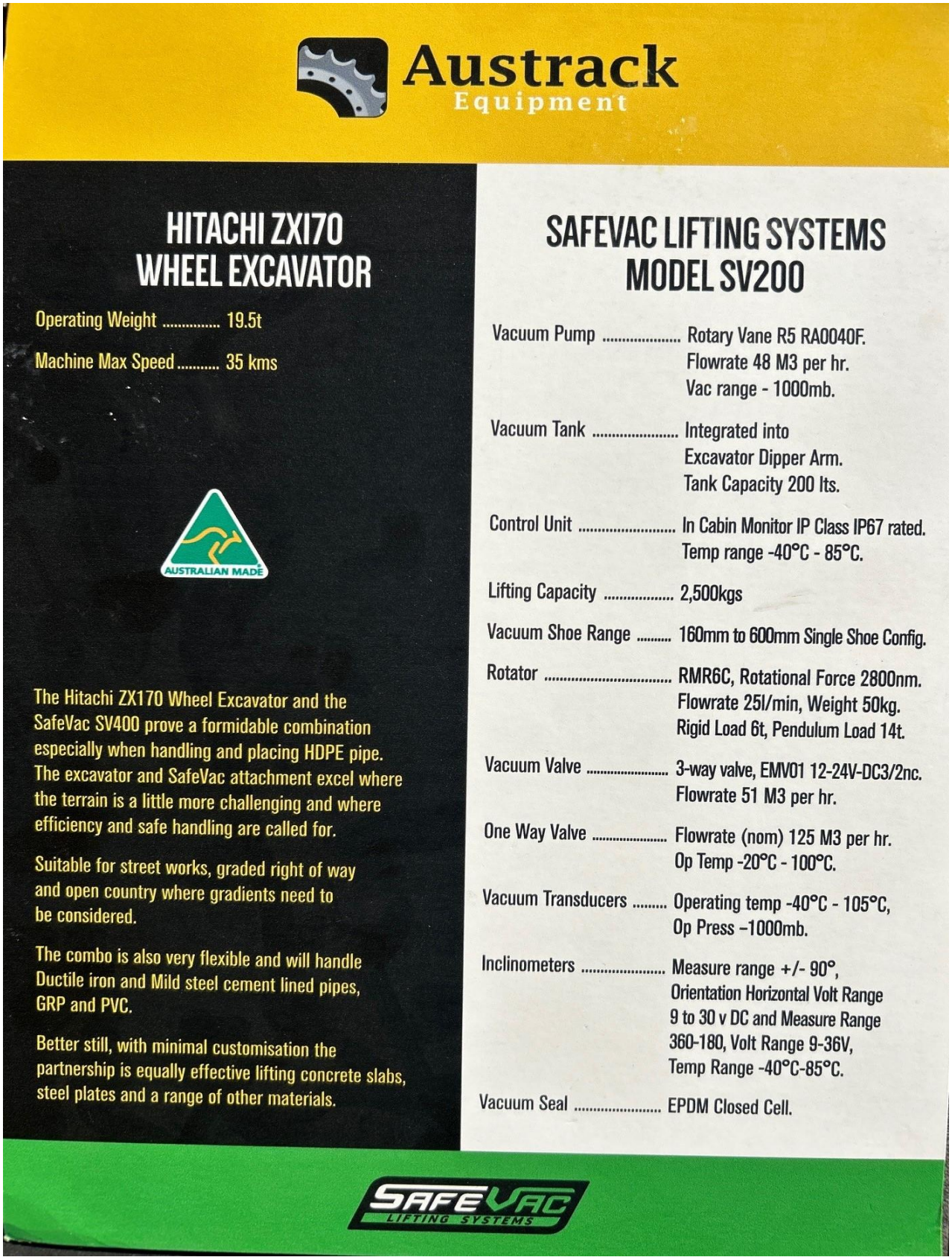
The development of the SV400 was only the beginning. One notable aspect of VLA technology is the need for customisation to cover the wide range of pipe sizes, weights, and applications that VLAs are required to operate within.

SafeVac Lifting Systems released a second VLA Model the **SV200 i**n October 2024.

This smaller model was designed primarily with **pipe lifting of hdpe pipe in gas gathering activities** in mind. Here the host machine is smaller as lifted weights are less and there are benefits in the VLA being placed on a wheeled excavator which delivers speed across the ground and manoeuvrability which are important considerations in gas gathering.



The SV200…… the dipper arm has been converted to serve as a vacuum chamber. The spreader bar is no longer required in single shoe mode.



Typical Specification for the SV200 when working in combination with a Hitachi ZX170 Duck

The SV200 model , while retaining all the control system and safety benefits of the bigger unit including the rear mounted pump and tank assembly which provides counterweight benefit, **has a radical new design feature.**

This feature consists of a modification to the machine dipper arm allowing the relocation of the vacuum chamber from the spreader bar to the newly created vacuum chamber in the excavator dipper arm.

This allows the removal of the spreader bar with the resulting weight reductions in all single shoe applications and is the critical design innovation which forms the basis of this submission.

View a video of the SV200 unit in action by pressing Control on the link
https://youtu.be/Hz_540OO4zM?si=TXK2clGx0neHojJe

The Dipper Arm Modification

Fig 1 ***Showing a schematic of the system layout***

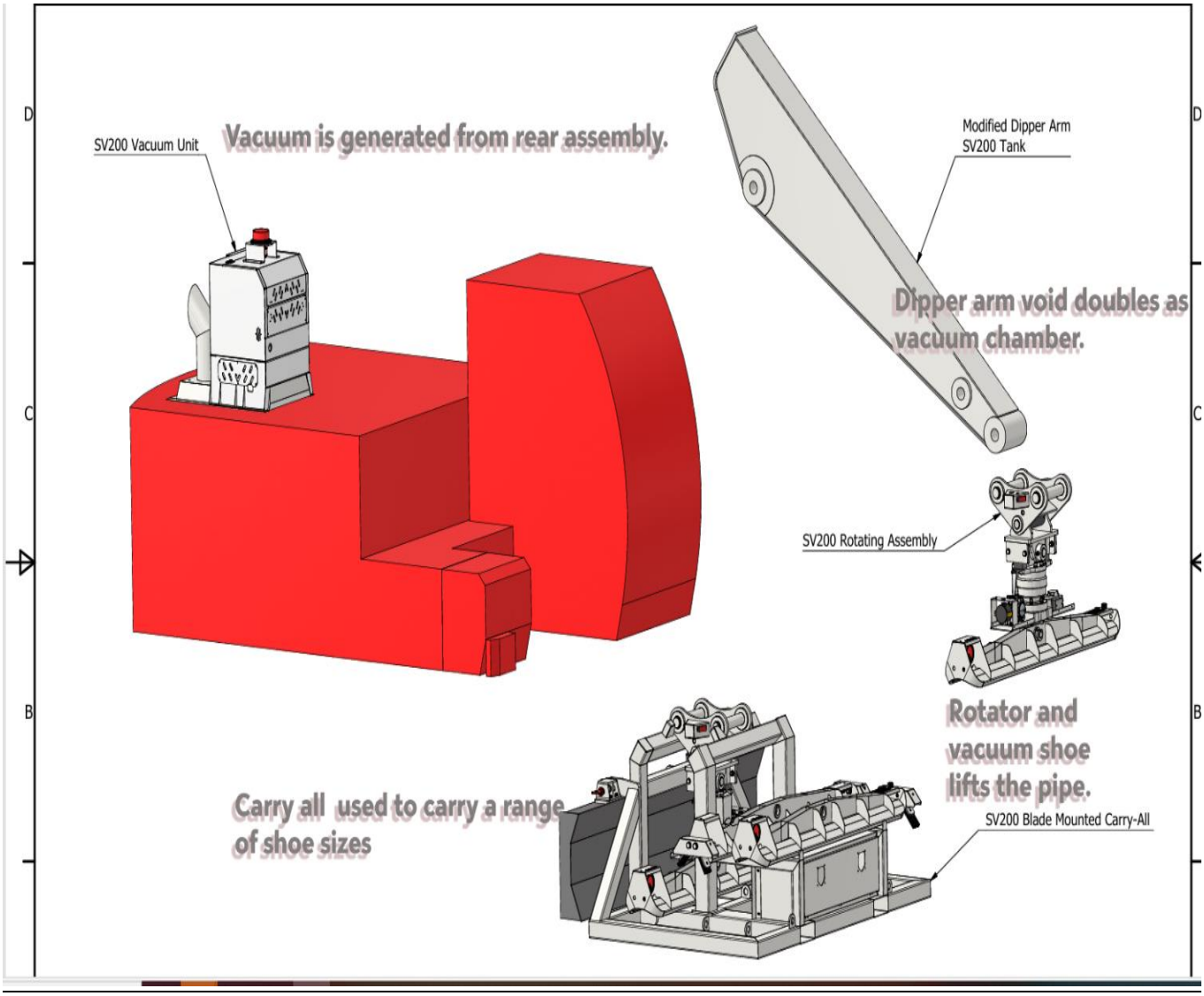
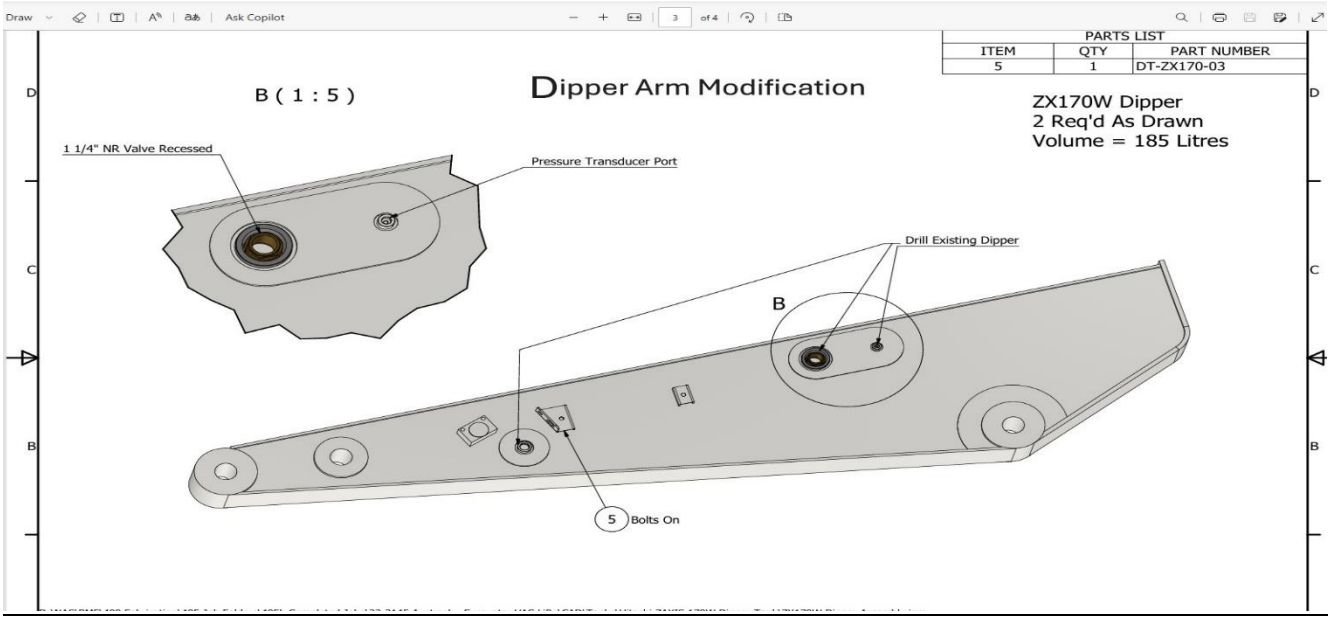


Fig 2 ***Showing a detail of the dipper arm modification to achieve the change***



IP Patent

As with its earlier model Austrack Equipment have sought patent protection for their new vacuum storage invention and have been granted **Provisional Patent application no 2025902880** titled Vacuum Lifting Apparatus and Components Therefor.

Basis For Consideration

The SV200 vacuum chamber design change results in the following benefits.

- **Reduction in manufacturing cost** by dispensing with the need for a spreader bar where single shoe use is called for. Cost savings are estimated to be 25% of normal production cost representing **a $ saving cost of $28,750** per unit on the SV200 unit **and $37,500** on the SV400i due for release later this year. This has both **sustainability and environmental implications**.

- It provides for separate but complimentary use for a component of the host machine that reduces the total manufacturing content for the VLA. This dual use again results in **a reduced carbon footprint** both in the initial manufacture of the VLA and operationally when the unit is in use.

- Overall simpler design means **less components and less to go wrong from a machine maintenance** viewpoint.

- The weight reduction at the lifting end effectively **increases the weightlifting capacity** of the unit. The removal of a typical spreader bar weight of approximately **1,100 kg** will increase the

VLA's safe lifting capacity by an equal amount. This is a **direct efficiency gain** and in its current configuration on a Hitachi 17t wheeled excavator **raises the SWL from 1.4t to 2.5t.**

- The vacuum tank in the dipper arm is positioned directly above the single vacuum shoe ensuring **rapid and secure engagement with the lifted object.**
- Reduction from multiple (normally dual) to single shoe mode results in a **simpler procedure for the operator** to control and therefore renders a **safer lifting procedure.**
- The outcome is **more aesthetically pleasing** with the refined integration of the modified dipper arm making it difficult to determine where excavator ends and the SV200 begins.
- Since the introduction of the technology almost 12 months ago Austrack have determined the **design change is transferable to larger tracked machines** and have completed design and testing on one machine which has now been placed into service. The official release of its **SV400i** model featuring the dipper arm conversion on a tracked Komatsu 35t excavator. This will showcase at the Australian Pipelining and Gas Association Convention and Exhibition to be held in Brisbane in October 2025. The SV400i unit is the third model that SafeVac Lifting Systems™ . The i in the name denotes integrated.
- Notwithstanding all of the foregoing benefits of single shoe use there will be circumstances where multiple shoes and hence a spreader bar will be required. The system is designed so that a spreader bar can be easily fitted resulting in **inbuilt flexibility in the system design.**

Customer Response

The SafeVac Lifting Systems SV200 has gained enthusiastic acceptance since its introduction almost twelve months ago. Users have expressed satisfaction that the comprehensive and integrated control and safety system which was perhaps the most notable feature of the original SafeVac design is all retained in the SV200.

Customers particularly have welcomed the seamless conversion of the dipper arm to additional use which yields all the benefits listed earlier including cost savings at both manufacturing and operational levels.

Its development with the very specific emphasis on delivering speed and flexibility and efficiency in gas gathering activities in places like the Surat basin is being welcomed at a time when insufficient gas supply for domestic users in Australia is causing difficulties for consumers and is testing Federal and State Governments energy policies.

Austrack has supplied a number of units for use on the Santos GLNG Gatherings project.

"We currently operate a few SafeVac ducks in gas gathering operations within the Surat basis as part of the GLNG project. These vaclifts perform exceptionally well in the field. They are robustly built, and the design clearly reflects careful thought and a strong understanding of operational need.

One particularly impressive feature is the integration of the vacuum tank built into the dipper arm of the Hitachi machine a clever and efficient design solution. Additionally, being a single shoe unit there is no need for a spreader bar which simplifies the set up and enhances speed and efficiency on site when stringing pipe, a key advantage in gas gathering work.

The digital display is clear easy to read, and the menu navigation is intuitive. Hydraulic and electrical connections between the hitch and the machine are thoughtfully laid out making them very operator friendly. The vacuum controls are well positioned and straightforward further contributing to the systems ease of use and overall effectiveness.

Operating the SafeVac has been a highly satisfactory experience overall."

Robert Baumgartner Superintendent MPC Kinetic

<u>The Way Forward</u>

With the successful introduction of the new vacuum chamber relocation and the technology having been shown to deliver in the smaller SV200 the plan is to migrate this technology to larger tracked units which will deliver all the benefits already being realised in the SV200/Hitachi 170ZX combo.

This will result in the new technology being made available across the full range of larger tracked excavators. Scalability across the size range is assured.

Typically, these tracked units will be in the 35 ton to 70-ton range.

To that end Austrack has already completed its first **SV400i** unit. This unit fitted on a Caterpillar 336 excavator is already in service and performing flawlessly.

The **official launch** of the new SV400i is scheduled to occur during the **APGA Convention and Exhibition in Brisbane in October**, when the SV400i fitted to a Komatsu PC360LC-11 will be unveiled.

Austrack have assessed that 75% of its fleet of VLAs will be either modified or built from new to the new SV400i dipper arm conversion over the next 18 months delivering all the cost benefits and all the sustainability and environmental benefits that accrue with doing more with less.

Summary

We submit the VLA **vacuum chamber placement in the host excavator dipper arm** for consideration in the annual APGA Innovation Award on the following bases:

Originality: We believe this is a novel way to use an already manufactured component to reduce manufacturing and operational costs and at the same time realise a range of system performance improvements. We are not aware that any other VLA has adopted this approach.

Impact on Industry: We are early into this development, but initial acceptance of the technology has been high, and early indications suggest that this innovation will consolidate SafeVac Lifting Systems™ as an emerging force in pipelining VLA systems.

Scalability and Implementation: Almost twelve months into use on smaller machines and with the design change proven to deliver a range of benefits implementation across the board has already commenced and the plan to convert a sizeable proportion (75%) of the Austrack Equipment VLA fleet has already been actioned.

Alignment with APGA goals:

- Increased Efficiency,
- Proven safety regime
- Australian Made status enhancing local content ambitions.
- Protection of IP by lodgement of appropriate Patent applications.

August 29th, 2025.