KADOR ENGINEERING

KADOR ROADMASTER SPRAYRIGS

DESIGN DEVELOPMENT AND KEY FEATURES

HISTORY

Kador Roadmaster Spray Rigs have been developed over many years with design input from OEMs and many of the major mine owners and operators.

SAFETY/DESIGN

The design concept incorporates a monocoque construction fitted with a series of baffles strategically placed to give maximum stability and strength of construction.

As there are no design stability regulations available applicable to mine sites, Kador used the most stringent on-road parameters to keep the centre of gravity of the fluid load as low as possible.

We wanted to keep the centroid of the loaded tanker within a 62 degree angle from the outside of the rear tyres, and the prime mover axle loadings maintained within OEM guideline of 67% (rear axle) and 33% (front axle).

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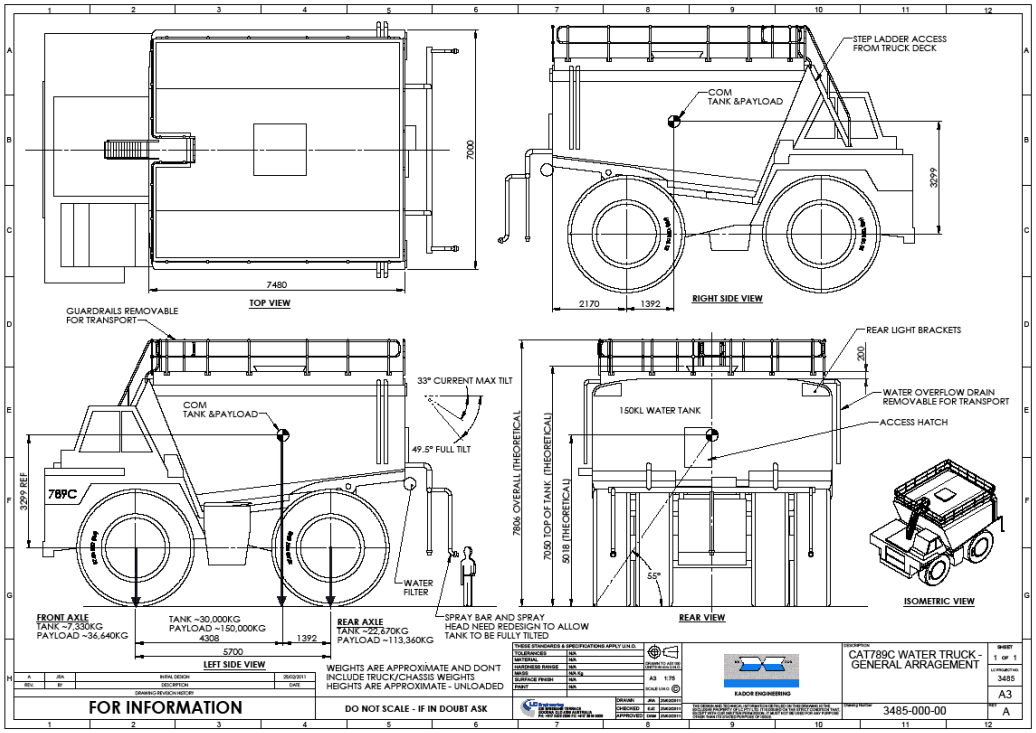


Initially, we had no real data to prove that the load dynamics were within acceptable limits, so additional testing was carried out on a mine site incorporating computer recorded strut movements from the suspension. Over a period, varying baffle placements were made and strut movements recorded until the optimum movement was achieved, reducing the possibility of fast water transfer causing instability. These readings were recorded at all levels from full to ¼ full, for both fore and aft water transfer.

This research has allowed us to offer a tank that has proven stability and allows our customers confidence in regard to operation in mining conditions. Even with this assurance, any fluid load can react in a manner that requires caution when equipment is being operated

WHY KADOR ROADMASTER RATHER THAN OTHER STYLES?

When assessing the design style we were going to use for our products ie Baffle style, Mast Style or Deflector Tube style, we decided that we needed to take into account the stability control as being the major parameter, then manufacturing complexity, and finally, the ability to carry out full surface treatment of the internals, to allow ease of maintenance over the life of the units and give the long life that Australian based mines required.

After a review, we concluded the Mast and Deflector Tuber styles may have been able to achieve the stability requirements, but none of the other factors were adequately met.

The Baffle design used in the Roadmster Spray rig also gave us a safer manufacturing design, as it reduced the amount of time our operators are in a confined space environment.

Surface treatment of the internals of the baffled tank, whilst still within a confined space environment, is more accessible than with other designs; enabling a superior tank lining to be applied with no hidden areas that are hard to treat in the initial applications as well as easier maintenance.

KADOR ROADMASTER MOUNTING APPROACH

We believed the major point was to maintain the integrity of the mountings used by the truck OEM - this then had the added advantage for our customer of standardisation of components, with the added ability to use the prime mover for its original design purpose as a rear dump truck, if needed without major modifications.

We used the standard body pins and front locators and tilt lock pins at full tilt, however we lowered the tank as close as possible to the chassis rails, again to keep the centre of gravity of the tank as low as possible, we also added a front tank lock-down facility for safety

To allow servicing the truck we then designed the tank to allow the fitment of the standard tilt rams and to allow full serviceability. The tank does have the ability to be taken to the same angle of the standard rear dump body. This gives the operator the ability to carry out even the removal of the gear box without removing the tank.

The tank and chassis have had full reviews for pinch points and safety locks carried out for the tilting operation including spray systems and options fitted to the to the tank, from the design to operational stage to ensure maximum safety during use.

FILL POINT MOUNTING

The standard fill point to the centre of the tank was chosen, it is a conical fill with extension height to reduce overflow while filling. Over time, due to the in poor quality of pit water all fill points had a screen fitted which reduced the size of the objects entering the tank. This screen has proven to have an additional benefit, it stops abrasive wear happening to the bottom of the tank in the initial drop of the fill, debris is kept away from the actual tank lining. In addition vents are fitted to the tank top to assist with the filling under high volume fills, this allows the air to escape and stops fill locks occurring.

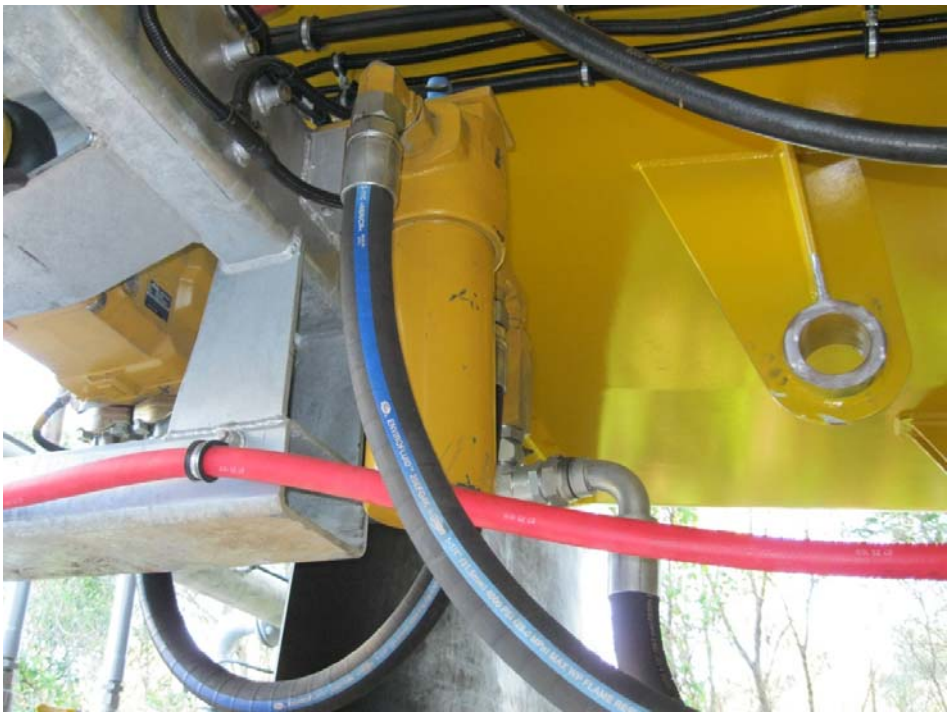
Options for fill points are available including SS baskets instead of grills. Again this tends to be a mine site operational request, because of the differing water qualities, and weed inclusion in fill points.

SPRAY SYSTEMS

The standard Kador Roadmaster pumping system was again developed in conjunction with mines and the OEM's. The system consists of a TKL Hydro Titan water pump sized to give the required output, coupled to a vane type hydraulic motor with a Fenner coupling. These components were selected as they were of a higher specification for mine use and in most

cases commonly available in the mining industry. In addition the vane pump gives lower contamination rates then the gear pump system generally offered by other manufacturers. The suction line connecting the tank through a screen filter is stainless steel.

Kador's hydraulic systems are fully isolated from the OEM system by approved filtration components, to eliminate the possibility of cross contamination; in most cases the filter used will be a standard OEM cartridge to fit in with OEM servicing regimes.



The control of the water volumes is carried out through the standard tilt circuit of the tractor by a control manifold system and a series of dash mounted control switches, the switches are electric over air solenoids to operate the main pump switch, sprays and other options as fitted. The solenoids are mounted in a stainless steel control box at the front of the tank to minimise water ingress. A total pneumatic system is offered as an option.

The standard system is totally reliant on the operator modifying the spray volumes to match the truck speed. The operator manually reduces the volumes by adjusting the number of sprays, and by bypassing oil supply from the pump circuits slowing the water delivery.

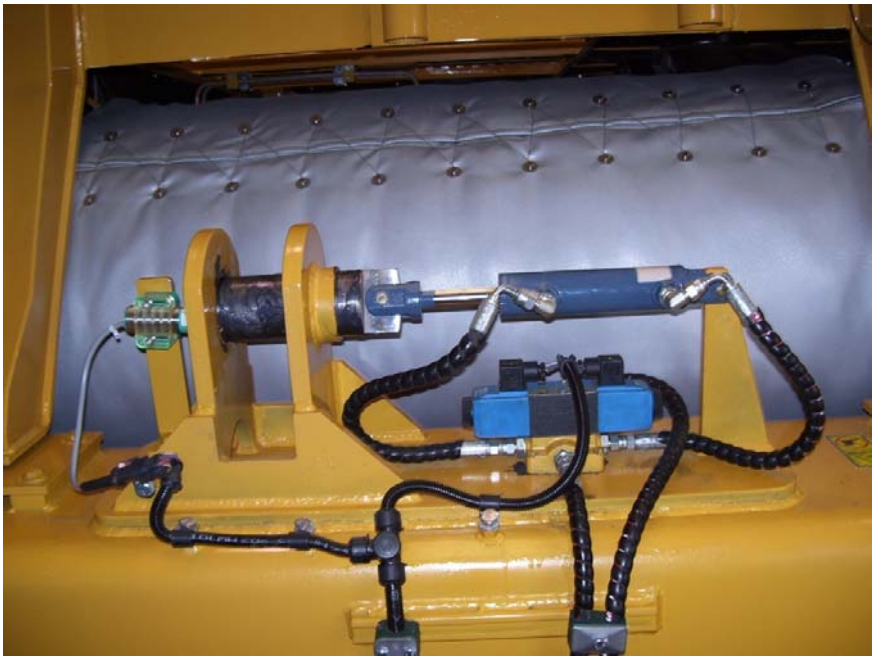
A FULLY ROAD SPEED CONTROLLED SYSTEM IS AVAILABLE

Kador is the agent for the Enviro-spray™ road speed dependent spray control system, developed and produced in NSW. This is a fully functioning system that links water spray rates to the truck road speed, and now has strong acceptance in mines throughout Australia.

TILTING OF THE TANK FOR MAINTENANCE

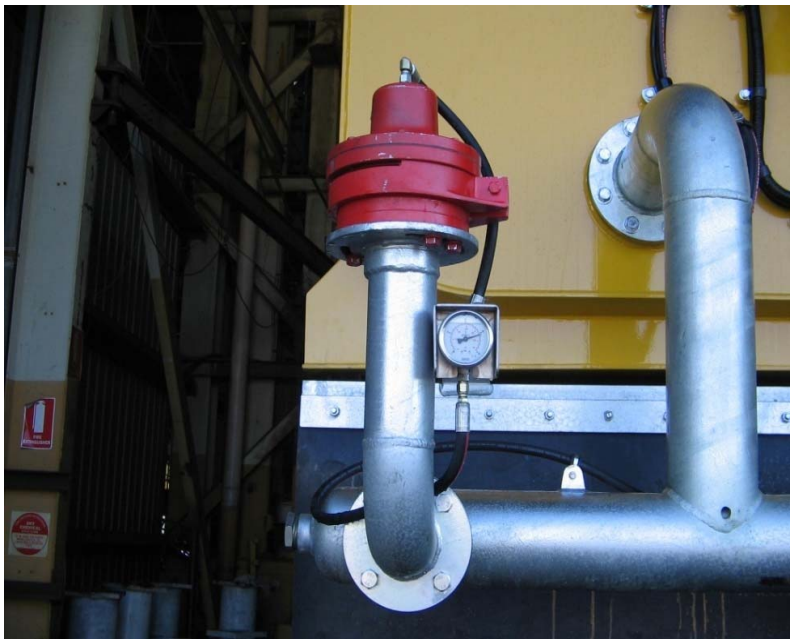
The tilt circuit of the tank is then coupled through the park brake hydraulic circuit which isolates the systems and stops the truck being moved in the tilt zone. Lifting ability is

restricted to the weight of the empty tank only, this eliminates the possibility of the tank being tilted when partially or full of water.



SPRAY BARS

THE Kador Roadmaster Standard system consists of a fully galvanised steel spray bar with three Magnum Type spray heads. Options are available to suit specific mine site requirements.



WHY THE ACCESS MANWAY IN THE REAR?

This access way has been added to allow easier access to the internals of the tank for maintenance, and when opened coupled with the top fill point allows a much faster flow of air through the compartments. This feature was added, as over time it was found the mines were using in-pit water and the contamination of weeds, gravel and other debris was finding its way into the internals, necessitating periodic manual cleaning. The additional openings made this operation much safer, clearing gas build ups quickly.

WHY IS A COAMING FITTED TO THE TANK TOP?

This was added to allow operators to use flood filling of the tanks. Without it, when a rig had just been filled and travelled up a ramp, water flowed over the original small directional coaming. Higher coamings were fitted that controlled the water, forcing it over the rear of the tank instead of over the sides, where it was causing major corrosion to the hydraulic and electrical services of the prime mover. Some mines prefer a full dam on the roof with control pipes directing the water even further away from the tank sides.

CORROSION PROTECTION

As previously stated the Kador Roadmaster tank has been designed to allow a fully integrated lining system selected for its durability and ease of maintenance, all areas on the internal section of the tank are easily accessible. The standard paint specification, which has been proven in over many years and hundreds of tanks is:

External

- Abrasive blast clean to AS1627 .4 Class 2.5
- Prime coat of International Intergard 251 to a OFT of 75um.

- Top coat of International Interthane 990 to a DFT of 50um

Internal

- Abrasive blast clean to AS1627 .4 Class 2.5
- Single coat of Jotun Jotazone to a DFT of 300um.

Other corrosion protection features include:

- Conduits supporting the electrical wiring are fixed with stainless steel Stauff type clamps and buttons.
- Suction lines and filters are stainless steel
- Spray bars are fully galvanised sections
- All brackets fitted to the tank are fully seal welded.
- Junction boxes are eliminated were possible and OEM specified type plugs are used for electrical connection.
- Control switch boxes are stainless steel.

ACCESS WAYS

Access to the top of the tank is by a folded ladder mounted on the tank front the ladder fitted complies with the mining access way codes required.

A standard lanyard rail is mounted to the top of the tank giving the operator an anchor point should they be required to carry out maintenance to any of the top tank mounted equipment. Hand rails also can be fitted to suit mine requirements, these can be folding or rigid type.

However we have attempted to eliminate all reason to access the tank top during normal operation and recommend that access is only carried out in a maintenance work shop.

FIRE FIGHTING CAPABILITIES

Over time, spray rigs have developed into support vehicles for fire fighting applications and again various options have been developed to allow this to be carried out as safely as possible.

Fire monitors can be fitted to the front or rear of the tank. Various monitor types are available, from manual operated types to fully remote units driven either by hydraulic or electric controls.

All monitors can be fitted with a foam system also worked remotely from the cab, the foam tanks again are mounted in locations selected by the mines. Stainless steel tanks can be fitted internally or externally to the main tank body, with supply connected to the monitor by a venturi system at a nominate ratio.

Standard fire hose connections are fitted to our standard spray bar system, the type of connection is nominated by the mine to suit their standard hose connection system.

Additional spray valves can also be fitted to the rear of the tank so that the operator can reverse into a tyre fire getting the protection of the tank whilst attempting to eliminate the blaze.

SUMMARY

Kador is extremely proud of the Roadmaster product range of spray rigs and we hope this document explains the development of the key design features of the product, and the input received from customers, OEM's and our own engineering development team. We believe that the water tank is often seen as just that, when in truth it is an extremely important operational safety tool for open cut mines.