

Stopping seepage using an impact roller

By Stuart Bowes¹, and Derek Avalle² MSc(Eng) BSc(Eng)

While the arguments between politicians and farmers around the nation continue over the amount of water used for agriculture and the way in which it is collected or harvested, water loss, not just water consumption, remains a major issue that needs immediate action to remedy.

Numerous solutions have been put forward over the years, everything from concrete lining channels to stop seepage to complete coverage of storages in order to eliminate evaporation. Synthetic liners or the addition of materials such as Bentonite provide obvious solutions in many cases – but given the size of the storages found in the cotton industry, such solutions can be cost-prohibitive regardless of their effectiveness.

Viable solutions need to be practical, cost-effective over a broad area and readily available to the wider market. The self mulching soils generally found in the cot-

ton regions throughout Queensland and NSW provide an opportunity to use simple compaction as a tool to minimise water loss through seepage.

Australian company Broons, has pioneered the development and use of impact rollers for soil compaction throughout the world over more than 25 years and since the early 1990s they have used this unique machine to minimise seepage through water storage floors and walls and on channel banks. Some of the largest and most high profile projects on earth have used Broons' equipment, including the enormous offshore Palm reclamation projects in Dubai, so their experience extends far beyond our shores.

At home, cotton growers and irrigation boards around the country have made good use of the same unique technology to overcome their seepage problems when compaction of the soil can be identified as a way to rectify the problem.

A number of trials have been conducted across a wide spectrum of projects in order to validate the technique. As far back as 1992, geotechnical consultants Golder Associates reported their belief that given the low permeability of the clay soils found near Moree, the use of an impact roller to seal the floor of a leaking storage would more than likely produce satisfactory results.

Wind blown sands and holes caused by burrowing animals and decayed roots had aerated the soil profile to such an extent that water loss accounted for around 24 mm per day through both evaporation and seepage, ...26▷



An impact roller working on a channel bank.

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LEVEL 16, 55 HUNTER STREET SYDNEY NSW 2000 PO BOX 475 SYDNEY NSW 2001 DX 605 SYDNEY
P. +61 2 9225 2500 F. +61 2 9225 2599 www.kempstrang.com.au

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while a similar storage not far away in Narrabri lost less than four mm. A program was developed to deep rip the floor of the storage in order to break up the soil profile before impact rolling, a procedure that has since been replicated many times on other projects with good results.

Cotton grower Peter Glennie from Norwood near Moree, has been a strong supporter of the impact rolling concept, having first used it back in the early 1990s on his storage floors and channel banks.

In a story in *The Australian Cottongrower* in December 1994 he commented, "There is a lot of discipline involved with building banks with a bulldozer. You need only have one weak spot in a job and you have a major problem and if you happen to inadvertently leave an uncompacted spot, the impact roller will find it and fix it." He also observed that even where fully laden scrapers had been working, the impact roller still induced even further settlement indicating the energy imparted from the square compactor module exceeded that from the scrapers.

The Broons impact roller generates a significant amount of energy with every blow of the square compactor module and can produce compaction results that far exceed those achieved by static or vibrating rollers both in depth, density and productivity. An impact roller can cover around 2000 square metres per hour with 10 passes of the machine at a speed of around 10 kph.

It was not until 2000 that the idea of impact rolling storages and channel banks really began to gain acceptance. Peter Cottle, the former head of Clyde Agriculture's cotton operations at Bourke was a strong advocate for the concept when developing their huge storage on Beemery. A condition of the development included achieving minimum seepage levels and trials

indicated impact rolling was able to achieve this. Peter then went on to develop an annual program of treating all storages and channels across the many properties in the Clyde Group, a program which continues to be implemented by his successor, Mitch Abbo.

Due to their very nature, the floor of the storage needs to be dry or at least drying for the impact roller to work successfully. On the other hand, growers commonly want to fix problems with seepage through storage walls and channel banks when the seepage is obvious – for example, when the storage or channel is still in use – since that is when they notice it the most. This presents a different set of challenges as the soils are generally saturated in the very location they need to be compacted.

Ideally, the most effective solution to the problem with walls and channel banks is to identify the area during irrigation and program the rectification works to be completed when the storage or channel has been emptied, though this is not always possible given the risk and cost of a blow out.

Anthony Barlow, Wyadrigah near Mungindi has recently completed impact rolling around 16 km of existing channel banks on his property from the top down. "There has been a dramatic reduction in visible seepages from the sides of the channels which are now in everyday use," he says. "Only one small area of seepage remains visible." At a cost of around \$420 per km for about 10 passes of the impact roller, there is a good case for improving channel bank efficiency by using the impact roller on top.

John Picone from Iolanthe between Moree and Mungindi has found similar results having also recently used the Broons impact roller when raising the main wall of his existing storage. "The maximum water depth is now 7.4 metres and the surface area around four hectares – the recent expansion increased the storage capacity from 1100 to 2400 megalitres," said John.

"We used the impact roller to compact the base and internal sides of the storage. Some areas of the floor were softer than others, particularly in the borrow pit, so we tailored the use of the impact roller to suit the prevailing conditions. The total cost of the exercise worked out to be around \$12 per megalitre, a relatively low cost to save a lot of water."

With water now in the storage, subsequent water loss testing carried out by Aquatech Consulting indicates seepage loss at less than 0.5 mm per day. "The seepage losses from this storage are excellent, with a yearly loss of less than 0.2 metres, assuming the storage is in use all year," says Aquatech in their report to the client.

There's no single solution to the problem of seepage from storages and through channel banks but there are some economical and effective solutions being proven that offer real benefits. The Broons impact roller is one of them with a good track record over 25 years

¹Director; and,
²Technical Manager, Broons Ltd.



Compaction is often a viable option to minimise water loss.