

Building Big Tanks and Bridges

Getting the Best from Plywood Moulds

In the early days after I developed Repel for Adchem Industries – see [Company and Repel](#) and [The Repel Story](#) – I made a trip to see mould release agents (MRAs) in a wide variety of practical uses. One of the most challenging applications was a major water filtration plant being built by Boulderstone Hornibrook at Loxton on the River Murray. The contractor had to guarantee no leaks for 25 years, so products and processes had to be world's best practice.

The overseer, Brad Fleming, was keen to point out how different these outdoor conditions were from those in factories. MRAs had to perform in situations which were much less controllable than inside a factory –

- Climate was out of control, always hotter or colder, and certainly drier than inside when fully exposed to sun. Also wind, rain and dust created their own havoc.
- Pours were large – up to 6m x 12m, poured vertically in thicknesses of 300-400mm, sometimes up to 600mm.
- Forms were F27 plywood, the hardest, most water resistant grade available, fixed to frames, butted and glued together to make panels 5m x 6m which were hoisted into position by cranes. The most intensive activity on the site in terms of both men and area was the repair and preparation of plywood moulds. After 15-18 uses they were discarded, being too damaged to be used again.

The preferred MRA was a premium cream which left a waxy coating, providing the best release, but with several serious problems. It had to be applied by roller or airless spraygun, then smoothed out. The thick foam as applied was quickly spoiled by airborne dust, within half an hour on a windy day. And the product was nearly three times the price of conventional MRAs. Oleic acid in heating oil was the compromise MRA, but its effectiveness fell substantially after exposure for more than two days. This was judged both by the feel of the oil which became more and more contaminated by wind-blown dust, and by increasing difficulty in removing formwork in an undamaged condition.

Forms were removed as soon as possible after pouring, generally within a day, when concrete strength had risen to about 17MPa. Reduction of the time of contact between form and concrete was the main reason for choosing concrete with high early strength. No amount of MRA seemed to prevent water wicking across the form/concrete interface during their few hours of contact. This was evident by expansion of each section of form, generally about 6mm in each direction. Longer times of contact resulted in further wicking and always caused greater difficulty in removing the forms. The more swelling, the more difficult was the release. The separation of concrete from forms was the major cause of surface damage to both.

It was apparent that contractors in these situations needed several new features in their MRAs –

- a mould release which remains effective for days in dusty conditions,
- a much better barrier against water wicking from concrete into formwork, and
- a waxy rather than oily barrier, with better lubricity.

The test for **Repel** in this situation came unexpectedly. In 2004 the New South Wales Roads and Traffic Authority (RTA) built a new road bypassing the small town of Lidsdale between Lithgow and Mudgee on the Castlereagh Highway. The major construction on that section was a new \$3m bridge over Cox's River. At that time Berryessa was setting up a new manufacturing plant in Lithgow and was in the midst of battles to secure the Repel patent – see [The Repel Story](#). We knew about the highway and other local works, but since this was well underway before we began, we didn't bother chasing business on that site. Therefore, I was surprised and pleased when Berryessa was approached by the contractor to supply a mould release agent for on-site bridge works.

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The key to this request was that the RTA insisted on non-polluting materials being used to avoid potential contamination of Cox's River, part of the Sydney catchment basin over which this new bridge was being built. Word was obviously getting around that viable replacements for conventional diesel-based MRAs were becoming available – see [Quality Needs for Concrete Mould Release](#). The fact that Berryessa was approached on the run by the contractor, Waeger Constructions of Rutherford in the Hunter Valley, suggests that either Waegers had taken insufficient notice of a pollution clause in their contract or else the clause was a late drop-in by the government.

We soon heard that a month earlier Waegers had sourced another brand of water-based MRA for moulding the prestressed bridge sections in their factory, but had had a lot of trouble with using that material over the top of oil residues left by years of diesel-based MRAs. That seems to be why Waeger's supervisor, Guy Dickinson, was asked to source another MRA, and word got to me via the local grapevine. We supplied **Repel 64** for application to plywood moulds to be used for all on-site pours.

Guy came back to me to say that the Repel *disappeared* meaning that his coated forms showed no signs of coating. I knew that one of the main reasons **Repel** works so well is that it soaks into the surface of whatever it is applied to, even steel, before any excess forms a membrane on top. I think that is a good feature of any MRA, but Dickinson wasn't convinced, so he recoated about half his forms with **Repel 64**. This time the forms showed some glossy evidence of the coating, so he was pleased.

He said the pours would happen in about one week. I was rather alarmed when nothing was done for 16 days during which those coated forms were out in the weather. This was November, between seasons when the weather could be anything, and it was. Three days of light rain wasn't a bother because it takes more than that to wash off **Repel**, but



Lidsdale bridge in 2008 when the upper Sydney catchment was a lot drier than in earlier years.

a dust storm was a worry. I was concerned that salts in dust would partly deactivate **Repel**. Dickinson rang me after it was all over – I had wanted to see the action – and said that all forms released well whether they had been coated once or twice. It was then that he told me the unhappy experiences they had had with another water-based MRA in the factory.

Repel 64 looked, felt and behaved more like a wax on those plywood forms – the desired effect gained with the premium cream but at one third the price and with none of the impracticalities. All our experience suggests that **Repel 64** forms a very effective waterproof barrier. The fact that the contractor found no problems removing plywood moulds on the bridge indicates that swelling of the moulds was negligible. Also, the resistance of **Repel 64** to 16 days of weathering contrasts with the two day limit found with conventional MRAs.

Repel 64 has enabled substantial improvements in quality and cost savings in some very demanding outdoor applications using plywood forms.