

Quality Needs for Concrete Mould Release

**petroleum → vegetable oils → water-based
better performance, better cost benefit
improved health, safety and environment**

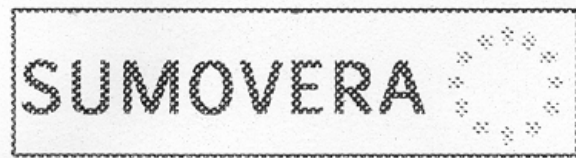
Early attempts to stop concrete sticking to moulds are mentioned in [Concrete additives](#) – go to Downloads. Mixing release agents into wet concrete in the 1920s was so unrewarding that the use of external release mechanisms seemed the only way forward. Various kinds of **waterproof membranes** were laid against moulds to stop adhesion, but these added a lot of time and expense to building projects, and even small leaks caused damaging adhesion such that membranes could not be reused.

Applications to moulds of an organic acid contained in light oil became the norm by the late 1930s. They are still used widely, but very costly mistakes can happen. In 2001 I saw a six tonne concrete culvert standing broken and useless because it had stuck to its mould so firmly that the two could not be parted without catastrophic damage. The petroleum-based mould release was too thin for the job, so most of what was sprayed near the top of the mould ran down to the bottom, leaving the top of the inverted-U mould unprotected. Berryessa has been very conscious of this problem. All **Repel** products are designed for application at particular film thicknesses on vertical surfaces where they will stay put over a wide temperature range.

Some cowboy fabricators have used crude tricks. I once slipped over on a floor covered with sump oil used as a mould release agent. I've also been into sheds where all the workers' faces are red and their hands are cracked, looking twenty years older than their owners. This results from long **exposure to turps or diesel (distillate) fumes** in factories using mould release agents based on these petroleum liquids.

Residues of mould release agents retained by concrete became an **environmental issue** in the 1980s. The European Union became concerned about residues from at least 80,000 tonnes of these agents being used annually on building sites and in making precast concrete parts. By the 1990s European sensitivity to the polluting effects of these agents had grown to such an extent that municipal dumps began to ban dumping of concrete demolition waste because it contained mould release residues.

In 1996 a group of Dutch, French, German, Portuguese, Finnish and French experts in environmental safety, civil engineering and concrete technology began the Sumovera project



– **S**ubstitution of **M**ineral **O**il based concrete mould release agents by non-toxic, readily biodegradable **V**egetable oil based **R**elease **A**gents. They spent a lot of money - DM18m in 1999, their final year - but they didn't solve the problem.

The best legacy of the Sumovera project is its set of criteria for mould release agents which include several important improvements –

no exposure of workers to harmful volatile organic chemical (VOC) vapours

no fire hazard

reduced emissions into the atmosphere

no strong smells

no generation of hazardous wastes

biodegradability, thus reducing financial risks in case of spills

a green image shown to clients

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In the 1990s **vegetable oils** and some semi-synthetic oils stepped into the void created by HSE (health, safety and environmental) concerns over diesel- and turps-based agents. A Sydney factory making millions of roofing tiles tried various vegetable oils as mould releases, but after a few production cycles, a build up of carbonized hardened oil on the moulds tended to fill in the indentations, thus reducing the profile of the moulds. Tongues designed to lock tiles together did not lock, and company brands could not be read. This meant that different types of tile were being confused because their moulded names could not be easily read, and roofs began to leak as poorly locked tiles shifted. The vegetable oil supplier solved the problem by coming back with a 60% solution of oil – in distillate!

All oils become more viscous in cold weather. **Repel** has no such problem. Oils without thinning solvents are not easy to atomize by conventional spray equipment. Small nozzle apertures need uncommonly high pressures, but larger apertures deliver drops which tend to curtain rather than form thin uniform films. One concrete tile factory where **Repel** passed all trials was prevented from using **Repel** because one of the directors had just returned from the US where he had bought one of these high pressure, temperature controlled oil sprayers at great expense and was not about to have his judgment shown to be wrong.

Before the first **Repel** product was first marketed in 2000, water-based mould release agents had acquired a bad name for the best of reasons – they didn't work well. This was no wonder because they tended to be simply oils dispersed in water, too much like milk or cream. Any petroleum or vegetable oil put on a mould will tend to stay there – in fact, be imprisoned there – if anything watery is held against it. Therefore, mould release agents made from anything oily usually work well unless agitation, abrasion or surface defects disrupt the thin petroleum membrane at the interface. In contrast, putting an oil-in-water suspension on the mould, then immediately pouring in the wet concrete, simply mixes two watery fluids, so there is little or no barrier between the concrete and the mould.

Repel is very different. While there are substantial differences within the **Repel** range, all these products have a common patented feature and manner of working. **Repel** is made in demineralized water in the complete absence of salts. The water in wet concrete is full of alkaline salts which, upon contact with **Repel**, immediately precipitate the active ingredients, forming a waterproof layer against the mould, protecting it from bonding to the concrete as it sets. The water in **Repel** disperses into the concrete water, leaving only a very thin film of mostly natural products which sticks to the concrete as it sets.

The real advantages of **Repel** are its high activity and its sophisticated, non-polluting delivery system. Berryessa gained business in bridge construction in the Sydney catchment basin because **Repel** is environmentally responsible, being 99.8% free of pollutants, and degrading harmlessly within a few months. When applied correctly, the spread of active ingredients across a mould is remarkably thin – 20 to 100mg per square metre. The art of **Repel** is its delivery of those ingredients in a solution which reacts so fast with wet concrete that it forms a perfect waterproof membrane against the mould which will withstand the extreme abrasion commonly used by applicators in order to achieve smooth surfaces. Where **Repel** really shines is in applications generating great heat – download [Making Big Pipes](#).

And **Repel** cannot catch fire like every kind of oil. A hardrock mine using petroleum oil as a mould release in its underground concrete plant switched to Berryessa's **Repel** water-based mould release after a coating was set on fire by welding operations.

Berryessa is proud to claim that –

Repel products are highly responsible in both design and manufacture –

- *no components are classified as hazardous at any concentration by Worksafe Australia*
- *the proportion of finished product derived from non-renewable resources is below 0.3%*
- *except for washout processes, no wastes are produced at any stage of manufacture.*

The Repel range of mould releases satisfies all of the Sumovera criteria.