



Reinforced PTFE Mould Release for Optimum Performance & Mould Protection

Wind Turbine Manufacturing— The game is changing

Need for efficiency fuels quest for improved mould release technology.

Wind turbine electrical power generators are not new to the landscape, but the rate at which they are appearing has shown a dramatic increase in recent years. The drivers of this increased activity include fluctuations in fossil fuel prices as well as local, regional, and global initiatives to increase overall capacity for clean, renewable sources of energy whilst displacing dirtier forms of conventional energy that contribute to atmospheric contamination and global warming.

Additional incentive for the rise of wind energy has come in the form of government subsidies and feed-in tariffs that have stimulated both the demand for wind turbine generators and the research and manufacturing activity that has spawned newer and increasingly more efficient technologies.

With the increase in demand and, in some jurisdictions, public funding stimulus, the number of manufacturers has increased in a market that is demanding greater productivity, as well as higher blade performance and cost efficiencies.

For blade manufacturers operating in these market conditions, R&D and efficiency becomes necessary to guarantee future competitiveness. On the energy production side, efficiency is measured in terms of blade / turbine energy output. On the manufacturing side, it is the ability to produce quality blades at lower cost. These are important issues that support the need for new technologies and methods across all aspects of the wind blade manufacturing industry. As a significant component of the moulding process, the performance characteristics of the mould release layer is an important concern—one that can substantially increase (or decrease) plant output and production efficiency.

Thus, mould release technology is the subject of this paper.

For Green Belting Industries, this paper best describes why we have entered this market, and due to the success of our R&D and introduction of mould release products, why we are attracting the interest of a growing number of leading blade manufacturers.

PTFE Mould Release for Optimum Performance and Mould Protection



De-moulding and / or post processing can increase cycle times and labour costs.

The wind turbine blade manufacturing community has in the past relied on mould release products that have not always delivered the degree of production performance and mould protection sought after.

The materials most often used for this purpose have included liquid mould release coatings and standard adhesive backed PTFE coated materials.

The demands of the industry are significant, taking into account the substantial size and cost of today's wind turbine blades, as current trends continue these blades will only increase in size.

Many of the solvent based release agents contain toxic ingredients that can be harmful to the personnel who use them.

In brief these demands reflect on the quality of the blade produced, whether damage occurs to the blade during the de-moulding process or if an inordinate amount of post processing must be done, thus increasing cycle times and labour costs.

Another consideration is protection of the mould itself. Damage to the mould surface caused by an ineffective mould release product has a potential two fold effect. Mould life can be reduced by surface damage caused by a less than optimum mould release system. As well, the cost associated with the time needed to make necessary repairs, to enable the mould for future use, can be a drain on production efficiency.

Drawbacks of conventional liquid mould release products:

- Mould release coatings must be cleaned off and reapplied after just one or a few cycles.
- The application method introduces the potential for an inconsistent or unevenly applied mould release layer. The result is inconsistent blade release from the mould and higher production cost for each blade.
- In some cases tools are used to aid in releasing the blade from the mould which can easily result in damage to the mould surface.
- When the mould is damaged it adds to the cycle time between demoulds, as time is needed to repair the mould, and this slows down production.
- With the repeated application and stripping there is a risk of damage due to resin penetration and mould life is reduced.
- Many of the solvent based release agents contain toxic ingredients that can be harmful to the personnel who use them.



Many solvent based release agents are potentially harmful to the personnel who use them.

Standard PTFE mould release products have distinct advantages over traditional liquid mould release products:

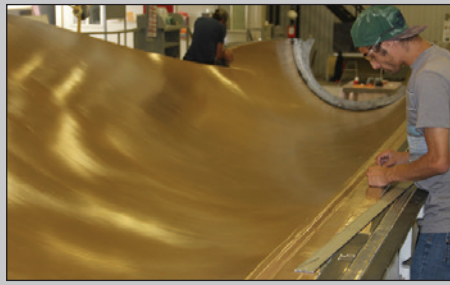
- One application of PTFE mould release can last many cycles, from 10 to 30, depending on the PTFE product chosen.
- Application of a PTFE mould release liner can be consistent from root to tip, thus enabling the release to be the same over the entire surface of the mould.
- Tools are not necessary to assist in releasing the blade, and in fact are strongly discouraged when using PTFE mould release products. The nature of the shrinkage that occurs during the process curing breaks the surface tension, causing the blade to "pop" out of the mould.
- Only minor cleaning and maintenance is necessary between each cycle to bring the surface back to an optimum performance level, enabling faster turnaround.



Wind turbines have greatly increased in recent times.



Application of PTFE mould release can be consistent from root to tip..



A specially engineered adhesive allows for easy installation.



Wind turbines have greatly increased in recent times.

GR6 can last up to 40 cycles and beyond before replacement is necessary.



GR6 Mould Release is a premium reinforced PTFE product developed for the wind blade market.

Premium Mould Release Solutions from Green Belting Industries Solutions

Through extensive testing in various live manufacturing facilities, Green Belting Industries has developed a range of products that take a major step forward from both liquid and standard PTFE mould release products in addressing the requirements and challenges of the wind turbine blade manufacturing community.

Green Belting's primary mould release liner, GR6 Mould Release is a premium reinforced PTFE product developed specifically for the wind blade market. Its unique attributes enhance performance and offer several advantages:

- Specialized additives and tortuous path technology, are used to produce a reinforced PTFE coating that resists chemical bonding and resin penetration which greatly extends the life of each liner which allows for a greater number of blades to be produced before the liner requires replacement.
- Specially engineered adhesive allows for easy installation and provides for resistance to regression of resin at edges and joints.
- Exceptionally smooth surface topography results in finer blade surfaces and less need for post-mould processing.
- Customers have reacted by stating the "mould release is no longer an issue" when utilizing GR6.
- GR6 is inert and therefore safe for environment and the workers.

During wind blade production, there are situations that may result in premature damage to the GR6 mould release layer. This damage usually occurs in the root where the blade is much heavier and of more extreme geometry. Green Belting produces a range of PTFE based mould release products that can be used as 'sacrificial' mould release solutions in conjunction with GR6 to provide more economical options for more demanding areas and when liner repairs are required when premature mechanical damage occurs.



Premature damage occurs in the root where the blade is heavier and of more extreme geometry.

Sacrificial Mould Release Options:

- 100-6S is the same thickness as the GR6, has a very smooth surface finish and has a lower m2 price point. However it does not contain the entire range of specialty coating techniques and performance characteristics of GR6. Nor does it resist resin penetration as effectively as GR6 and therefore will not endure as many production cycles. Nevertheless, for higher pressure areas and common 'wear points' 100-6S can serve as a lower cost 'sacrificial' mould release solution.
- 100-5S Tape is one thousandths of an inch thinner than GR6 and 100-6S. Its smooth surface texture compares to, and outperforms other standard grade PTFE products on the market. However, like the 100-6S, the PTFE coating of 100-5S does not utilize the same specialized coating technology as GR6, nor does the adhesive endure as many production cycles. As a result, 100-5S is best used as a lower cost sacrificial mould release option in higher wear areas.



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Conclusion

As global demand for wind energy continues to rise and the market seeks lower cost and greater efficiencies, there is new focus on the mould release process and the products that make that happen. New mould release technologies are playing an increasingly important part in the blade moulding process.

Conventional (liquid) mould release products, once the standard in slow-moving industry, are giving way to more efficient PTFE-based products and methods that improve output and quality while also protecting the mould from damage.

Where an application of liquid mould release may have lasted only 1-3 cycles, PTFE based products improved those results by a factor of 10 while also offering greater mould protection.

Now, with the introduction of GR6, an adhesive 6 mil reinforced PTFE glass mould release, Green Belting has established the latest standard in mould release technology.

With a proven performance rate of more than 40 blade cycles from a single application, GR6 is easy to work with, is inert, and safe for workers and the environment, and produces unprecedented blade quality.

As the wind turbine market continues to grow while seeking more effective and efficient blade manufacturing methods and technologies, Green Belting has taken a significant leap forward with the introduction of GR6 Mould Release.



Disclaimer

The information to which this document relates is offered as 'general' advice and persons / companies should not act or rely on it without relevant checks. This document is to be construed as general advice and due to the many different process, applications and products available in the marketplace every customer should make their own assessment and decisions regarding their individual process.

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