BEST PRACTICE

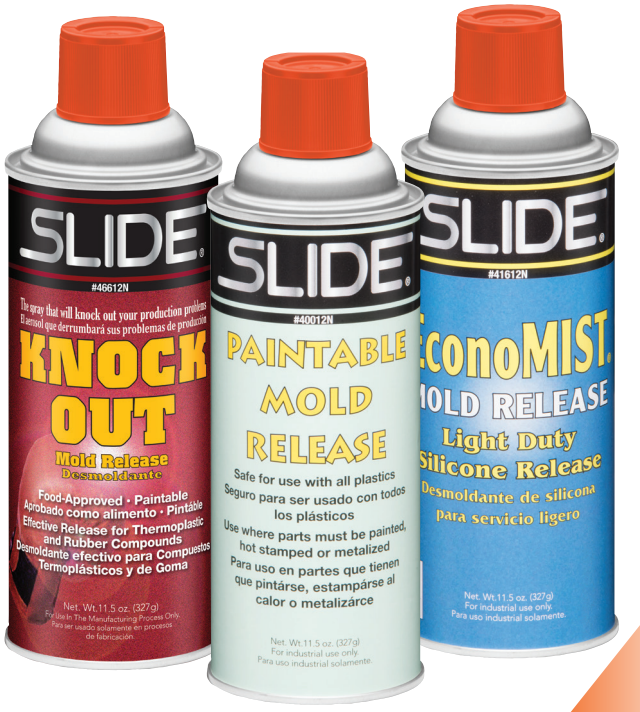
MOLD RELEASE AGENTS SELECTION AND USE

Selecting the best mold release formulation for your molding needs is certainly more science than art. Below is a list of the most relevant questions to ask when choosing your mold release product.

1. Are you molding parts that will filter into the food or medical market? If so, a food-grade or NSF-certified formulation should be considered.
2. Are you molding parts that will be painted or otherwise decorated post molding? If so, you should search for and use a mold release formulation classified as "paintable".
3. Will your molded parts be used in finished products that carry a UL certification? If so, your customer may require that only UL-recognized items be used to create those parts.
4. Do your molds contain difficult geometries that result in parts having a deep draw? Or are your parts otherwise difficult to remove from the mold? If so, a mold release formulation containing higher percentages of the active release ingredient may be required.
5. Would an aerosol mold release formulation be preferred, or would a liquid/bulk mixture be best suited for your mold release application preferences?

Once the appropriate mold release is selected, proper application and evaluation of that mold release formulation is essential.

1. While it may seem contrary to human nature, less is often better when it comes to mold release application. Less mold release applied to the tool surface can minimize the chance of the release material burning or building up on the mold cavity.
2. Applying mold release less frequently reduces the amount of time the machine is not running, thus increasing efficiency and profitability.
3. Less mold release on the tool surface can reduce the possibility of the part being contaminated with release oils, thus reducing the risk of a part needing to be cleaned.
4. Slide recommends that a mold release formulation be applied from a distance of 8-12 inches (20-30 cm) from the mold surface by using a sweeping action that ensures complete and uniform coverage of both the core and cavity sides of the mold. Special attention and extra release can be applied to problem areas where sticking is more common.
5. If spraying the entire mold, apply mold release in a consistent pattern starting at the top and working left to right as you move down the mold. You are looking to apply a consistent coating, not a heavy or wet looking pattern. More is not always better.
6. When evaluating a mold release, it is critical that you start with a clean mold surface. A mold cleaner formulation should be used to strip and clean the entire mold cavity before the new mold release is applied and trialed.
7. Most mold release formulations are classified as sacrificial formulations, meaning that some of the release oil will transfer from the mold cavity onto the part. This results in reduced releasability over time. When this occurs, additional mold release will need to be applied to the mold surface.
8. Molders should test their mold release and determine how many parts can be molded before reapplication is needed. There is a bit of trial and error involved with the proper evaluation of any mold release product. Ideally, a mold release should be reapplied a cycle or two before the parts would be expected to start sticking inside the mold cavity.
9. Depending on many factors, mold release may need to be applied to the mold anywhere from every cycle to perhaps as infrequently as once a day.
10. The proper evaluation of a mold release involves taking the total number of parts that can be molded when using one release formulation and dividing it by the cost of that can. This calculation can help determine the added cost per part of using a particular release formulation. In Slide's 70 years of experience helping molders, we have seen many instances when the cheapest product to buy actually turned out to be the most expensive to use.



BEST PRACTICE

PURGING COMPOUND SELECTION AND USE

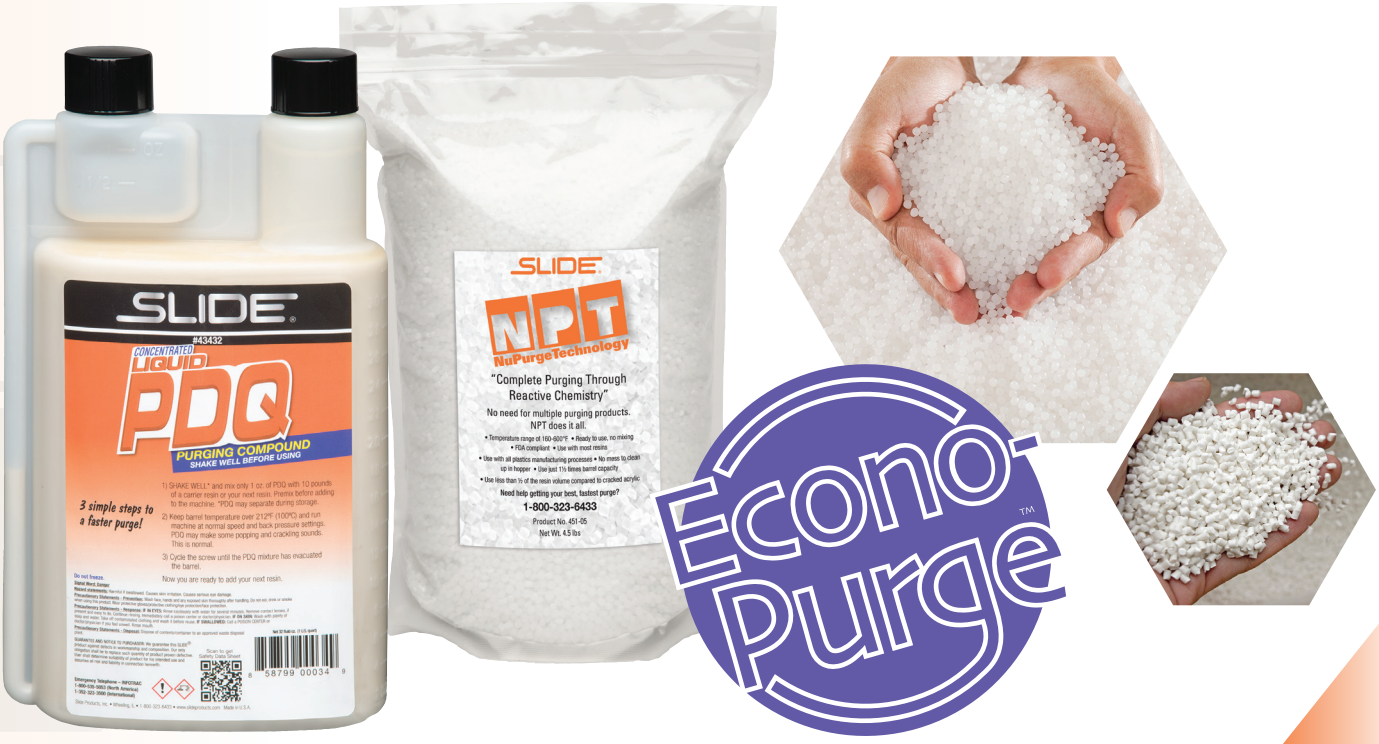
Purging is a necessary evil that most molders will need to perform as part of the regular maintenance plan when machinery has resin build-up or there is a required materials color change. Purging compounds work in several different ways including chemical or mechanical cleaning. The purge process involves a high level of proficiency and skill to ensure removal of any unwanted resin from the barrel assembly. A proper purging program can help molders reduce downtime and lower scrap rates.

As an alternative to using a commercial purging compound (CPC), some molders will simply keep running resin through the machine until they achieve a clean barrel. Other molders will throw rice, saw dust, or even powder laundry detergent into their molding equipment to help push out excess resin. Consistently repeating these techniques at regular intervals may prove to remove most of the old resin from the machinery. Therefore, the cost of the CPC could be eliminated from the purge process. Unnecessary downtime and resin costs are two of a molder's biggest expenses. The amount of revenue lost and resin scrapped during the purge practice must be factored in when evaluating the overall cost of purging.

Often, the price of the purging compound itself is a small percentage of the total cost involved. An online purge cost calculator that tabulates all of the possible related expenses while performing a purge cleaning, is certainly a handy tool to have when evaluating product options and the actual cost of performing a particular purging technique.

Below is a list of the most relevant questions to ask when selecting your commercial purging compound.

1. Are you performing regularly scheduled maintenance purges, or more difficult color or resin changes? Maintenance purges implemented before a weekend shutdown can be handled with a light-duty formula, while difficult color changes may require a heavy-duty purge product that can break down and force the undesirable residue from the screw and barrel unit.
2. Do your molds have hot runners? If so, a specialty purge formulation designed to flow through and clean out those smaller channels should be considered.
3. If you are molding with particular resins such as Acetal or Delrin, you should be aware that this might result in the release of concentrated amounts of acidic vapors during the procedure. A purge compound that will counteract this from occurring may be needed.
4. Be certain to check the recommended operating temperatures for any purging compound. Resin with higher operating ranges like PET or some engineering grade resins may require using a purge formulation specifically designed to work at those elevated temperature levels.
5. Each purging compound has detailed use instructions. We suggest asking for factory support to ensure you are using the most applicable product in the most efficient way.



BEST PRACTICE

RUST PREVENTIVES SELECTION AND USE

One of the fastest ways for a molder to go broke is to allow their mold or tooling equipment to rust. This most typically occurs when molds are in storage during periods of non-use. If rusting is not quickly corrected, expensive repairs will be necessary. It is not uncommon to spend several thousand dollars in restoring a rusted mold.

Using an inexpensive material that is not designed for industrial applications (such as WD 40) will likely yield disappointing results. Typically, these products are designed for water displacement (WD) and not for neutralization of fingerprints or acid residues. In addition to acid neutralization, a good anti-rust product will provide a protective film that gels over parts, flows into intricate, hard to reach spaces and covers up any nicked or scratched surfaces. It will not contain wax or other material that might adhere to the mold surface, nor will there be a need for extra cleaning steps.

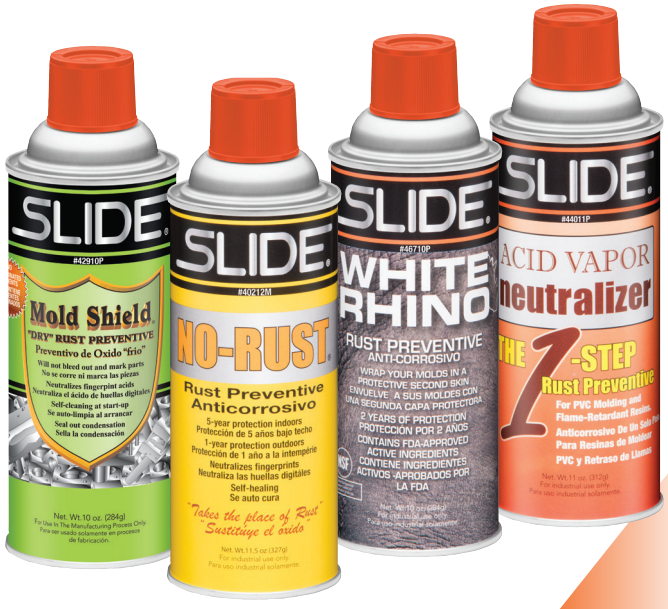
As with non-commercial based rust removal products, these rust-preventives should also contain the essential basics to displace water droplets that may have condensed on the mold itself. However, commercial grade mixes should provide necessary oxidation and corrosion stoppage to be of any significant use in plastics molding and manufacturing.

Below is a list of the most relevant questions to ask when selecting your rust preventive product.

1. How long do you intend for the mold to be stored? Molds kept over the weekend will require a far different level of protection than a mold being shipped overseas or one that will be decommissioned for months or even years.
2. Do your molds run resins that have outgassing of acidic vapors or contain flame retardant additives? If so, a specialized rust preventive formulation containing a high amount of a base material should be used to help neutralize those fumes.
3. Do you want a rust preventive that offers an added color dye to help ensure complete and uniform coverage across the mold surfaces?
4. Are you safeguarding a mold with a mirror finish or one that requires limited or no contact with a “shop rag” or other wiping substrate? A self-cleaning anti-rust product will usually flash off upon startup after a couple of molding cycles or can easily be removed with a fast-evaporating mold cleaner.
5. Are you molding parts that will filter into the food or medical market? If so, a food-grade or NSF-certified formulation should be considered.

Once the appropriate rust preventive is selected, proper application and evaluation of that chosen formulation is essential.

1. The evaluation of the effectiveness of a rust preventive is quite straightforward. Did this product protect the mold during the storage period and allow for a fast introduction of equipment back into production?
2. The most reliable way to protect a mold is to apply the proper rust preventive product onto the mold cavity immediately after the molding run is completed and while the mold is still warm. This will protect the mold as it cools down and allow it to be taken to the tool room before rust starts to form. We suggest applying the rust preventive formulation to the mold once it reaches 180°F or lower so that the rust preventive product does not flash off with higher heat levels.
3. Molds that are run with cooling water lines and those that are run in high humidity environments are especially susceptible to mold sweating during the cool down process. These would need to be treated with a rust preventive as soon as the production run is completed and the mold is still warm.
4. Spray the rust preventive product starting at the top of the mold, working left to right and moving down the mold cavity. Both the core and cavity sides of the mold require protection.
5. Once the mold is cooled to room temperature, a mold cleaner should be applied to the surface to clean and remove any unwanted contamination and to remove the initial coating of the rust preventive product.
6. When the mold is clean, a final coating of the rust preventive should be used on the mold cavity as well as the sprue bushings to help prevent rust from forming in this critical area.
7. When the mold is fully coated and protected, it can be closed and put into storage per your company’s shut down procedures.
8. “Wetter” or long-term rust preventive formulations may require a more intense mold cleaning process before it can be put back into production.



BEST PRACTICE

MOLD CLEANERS SELECTION AND USE

Maintaining molds is a key part of running a successful manufacturing operation. There are two situations when cleaning is required: on line when the mold is warm and is still in the press, and offline when it is on the bench and cold (room temperature).

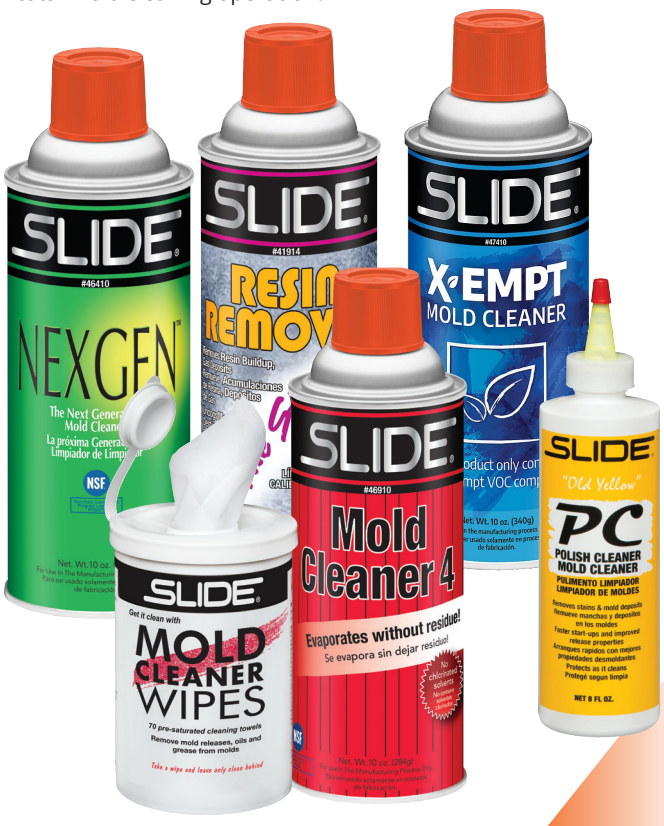
Because of ambient temperature differences, the various solvents used in mold cleaners will have different degrees of effectiveness based on when and where they are used. Solvents that work well offline tend to evaporate quickly when applied to the mold cavity. Using these same fast-evaporating formulations on one that is hot or active on the press may not allow enough time for the solvents to react with the unwanted contamination, thus rendering them ineffective. Conversely, those that offer better results at higher temperatures tend to produce poor outcomes at room temperature and can take longer to eradicate impurities or quickly dissipate. Using the wrong mold cleaning agent will likely be a waste of time and labor.

Below is a list of the most relevant questions to ask when selecting your mold cleaner product.

1. Are you cleaning the molds when they are warm and in the press, or when they are at room temperature and in the tool room? Cleaning a warm or hot mold surface will require the use of a slower-evaporating solvent blend. Molds that are offline can be cleaned with a faster-evaporating formulation.
2. What are you looking to clean and remove from the mold surface? Is there oil, mold release, grease, or other oil-based contaminants present? If so, then the "standard" products should suffice. If the mold is soiled with burnt resin, gas deposits, plate out, color stains, or other "heavier-duty" toxins, a specialty mix made to aid in such removal should be selected.
3. Are your molded parts utilized in the food or medical market? Choosing a food-grade or NSF-certified cleaner should be considered.
4. Would a pre-saturated "wet" wipe be beneficial for mold cleaning processes?
5. If you are using mirror-finished mold cavities, you should consider only a fast-evaporating product. This can help to avoid scratches and ensure that nothing comes in contact with that mirrored surface.

Once the appropriate mold cleaner is selected, proper application and evaluation is the next step.

1. If using a fast-evaporating mold cleaner, open tool and start cleaning from the top edge. Work left to right and slowly move down the tool. Let gravity help pull the contamination and debris down to the bottom edge. The mold cleaner will evaporate so there will be no need to wipe or touch the tool before placing it back into service.
2. If using a slow-evaporating mold cleaner, open the tool and start by spraying the entire area to be cleaned. As the product sits on the tool, it will begin to break down the greases, oils, and gas deposits on the surface. A rag or Scotch-Brite pad can be used in conjunction with the mold cleaner for more aggressive cleaning. Please note – highly polished equipment could be damaged and will need repolishing if using this procedure. Once cleaning is deemed satisfactory, respraying from top to bottom may be necessary to remove any excess material. Wipe with a rag or use shop air to blow off the tool to get the remnant mold cleaner to evaporate. If a "no-touch" finish is desired, follow instructions above for using a fast-evaporating mold cleaner.
3. Mold cleaners typically work best with a combination of physical and chemical cleaning. The flow and flushing action of the product being applied to the surface provides a portion of the cleaning operation. This physical force, combined with the solvency of the chemicals involved, is what ultimately offers the desired result.
4. Quantifying the value of a mold cleaner is not as simple as with a mold release. Attempting to evaluate part production increases as related to using a proper high-quality formula is difficult or impossible. Following the above recommendations and using appropriate guidelines is the best path for ensuring an efficient and total mold cleaning operation.



BEST PRACTICE

EJECTOR PIN GREASE SELECTION AND USE

Ejector pins, plates, and other moving mold components typically have extremely tight tolerances. For these parts, a high-quality lubricating grease is essential to ensure the proper functioning of the mold and to gain the most efficient results.

Below is a list of the most relevant questions to ask when selecting your ejector pin grease product.

1. How hot will the mold be running? All greases have maximum operating temperatures, above which the grease will melt, run into the mold, and contaminate parts. You should ensure that your product of choice is able to withstand the operating temperatures of each mold to minimize or eliminate potential bleed out.
2. Are you molding parts that will filter into the food or medical market? If so, a food-grade or NSF-certified formulation should be considered.
3. If you are molding components where the aesthetics and cleanliness of the finished parts are important, a colorless selection is the best choice. Many commonly used products have an added dye and may affect the visual quality of the molded part.
4. How will you be applying the grease to the mold components? Do you prefer to use a pure grease product or one that is made available in aerosol form?
5. Will the molded parts be painted or otherwise decorated post-molding? If so, a grease based on silicone should be avoided as it may inhibit the decorating process.

Once the appropriate ejector pin grease is selected, proper application and evaluation of that grease formulation is essential.

1. Your company should develop a preventive maintenance plan for each mold. Preliminary testing should occur to determine how many cycles could effectively run before reapplication is needed.
2. It is easy to simply grab a tube of whatever grease is just sitting around the shop and use it to lubricate your mold components, but using the incorrect formulation can lead to bleed out, part contamination, and excessive wear on the ejector pins. Top quality ejector pin grease can save tremendous amounts of money and labor with reduced downtime and less rejected parts.
3. The recommended technique for applying grease to an ejector pin or other moving mold component is to apply a heavier coating to the back half of the pin, and a lighter/thinner layer to the front portion of it. Using this method typically provides the necessary lubrication to prevent excessive heat buildup or galling of the moving segments.
4. More frequent and lighter application of a grease to the operating mold components is preferable to applying too much.
5. Molding with resins that emit gases or contain flame retardant additives can tend to affect performance by gumming up the grease formula and lead to product solidification, thereby reducing lubrication properties. Under such mold making conditions, the grease should be reapplied more frequently.