

PROTECT YOUR ASSETS

Using Proper Maintenance Techniques to *Maximize the Benefits* of Your Fixed Lip Slot Die

Practical Content Delivered by EDI® Fluid Coating Experts

Slot dies provide important economic and productivity advantages over conventional roll coating, and fixed lip slot dies are particularly valuable for their ability to apply very thin coatings with great precision at high speeds. One key to prolonging the working life of these dies and obtaining the full measure of their benefits is proper maintenance by technicians and operators. What follows are recommended procedures for servicing or repairing a fixed lip slot die.

For starters, it is important to understand the various die components. The two basic parts of slot dies are the upper and lower die bodies. These solid steel components serve as the two halves of a single-layer die. Fluid enters the die through an inlet or “throat” in the lower half, is distributed to target width by a manifold, flows toward the die exit via a slot between the upper and lower bodies, and exits the die at the lip. Two areas that play important roles in the precision and uniformity of the fluid coating are the land length, which is the portion of the slot surface prior to the lip exit, and the lip face, which affects the application of the fluid to a substrate.

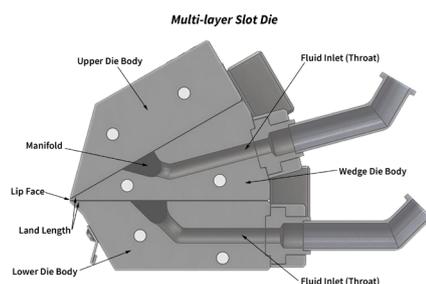
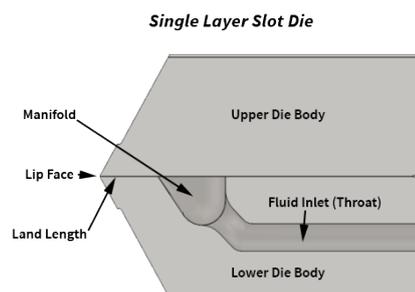
In multi-layer dies, the upper and lower die bodies are separated by a third body, or wedge, which adds a second fluid channel, manifold, and slot.

The quality of the finished coated product is directly linked to the quality of the flow surfaces of the manifold and land length and at the lip face. To clean the die, therefore, it is important to use only the materials and tools recommended for the task. In addition, maintenance personnel should take care to avoid damaging the front edge, lands, manifolds, or seal surfaces when working around the die. All jewelry, including watches, should be removed prior to cleaning or working with the die.

The following tools are typically supplied in a kit accompanying the die:

- an assortment of hex keys or Allen sockets
- a plastic feeler gauge
- push bolts
- turning bars
- a torque wrench

Other items that should be on hand for die cleaning include bottle brushes; a cup or catch pan; lint-free wipes; non-abrasive scrub pads; protective gloves; and a solvent for final cleaning. The gloves should be made of a material suitable for the fluid being applied by the die and for the cleaning solvent. In turn, the solvent should be compatible with the die body material and the process for which the die is used.



Disassembling and Cleaning the Die

Disassembly should begin only after the die pressure is at zero, the feed pump or any other connection to the die has been disconnected, and the die is fully supported to prevent damage. The disassembly procedure is as follows:

1. Place a catch pan or cup directly below the feed adapter and disconnect the feed line from the die.
2. Once fluid has stopped flowing from the die, remove and clean the feed adapter.
3. Loosen the top bolt of each offset block (described in the last section of this article) and place the bolts in a clean, safe place for reassembly.
4. Disengage and remove all body bolts, working from one end of the die to the other.
5. Remove the die offset shims (described in the last section of this article).
6. Using two hands, insert the turning bars into the upper die body.
7. Insert the push bolts into the upper body and thread them until the first sign of resistance.
8. Using a hex key, turn the push bolts until the seal between the die bodies is broken.
9. Use the turning bars to pivot the die body open. (Depending on the size of the upper die body, this may require assistance from a second person.)

If degradable materials are being processed, cleaning should take place immediately after shutdown and disassembly to prevent corrosion of flow surfaces. If the fluid to be cleaned away is difficult to remove, only a non-abrasive scrub pad should be used.

The cleaning procedure is as follows: With the die opened, remove the fluid from the internal surface of the upper body and apply the solvent. Next, remove the die body shim and clean it as well. Before cleaning the lower body, place a piece of tape across the body bolt holes to prevent fluid from getting into the threads. Once the majority of the fluid has been removed from the manifold and throat, the solvent can be applied.

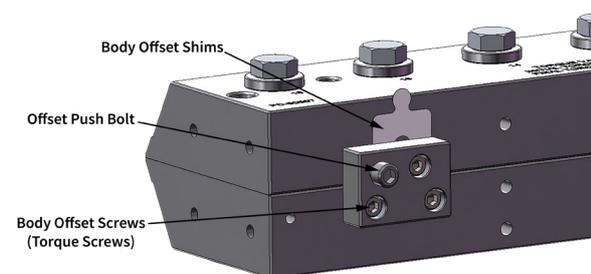
After cleaning, the flow surfaces, lips, and other areas should be inspected for damage. If damage is found, the die supplier or its representative should be contacted. Otherwise, the die should be stored in the provided shipping container with a shim placed between the die bodies.

Setting the Lip Opening with Shims and Offset Blocks

Operators make changes to the die lip opening by inserting a thin, interchangeable metal or plastic strip, called a “die body shim,” between the die bodies, and by installing “offset shims” at the rear of the die to establish the desired offset of the lip faces. The process of exchanging shims requires taking the die off-line so that it is under no pressure and exhibits no flow.

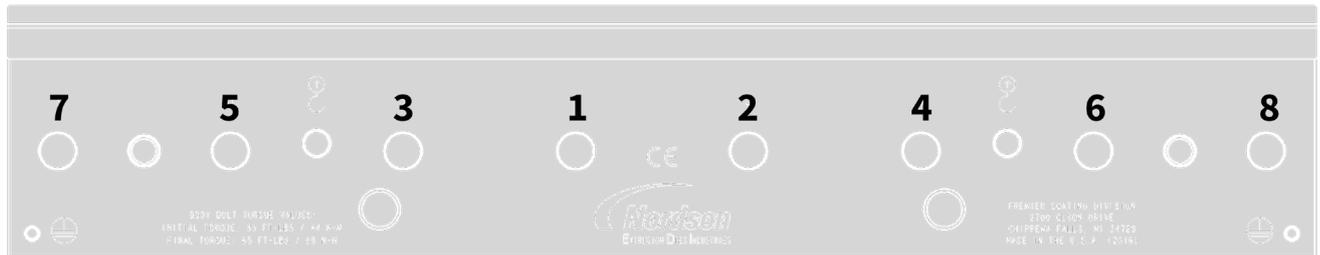
The die body shim is used to adjust the pressure inside the manifold to maximize flow distribution accuracy. It is aligned by dowel pins and is precision ground to match the lip face of the slot die bodies. The pattern cut into the shim allows for different coat widths up to the maximum width determined by the manifold.

The offset shims are used in conjunction with the offset block system located at the back of the die to adjust the lip faces either to be parallel or with an “underbite” or “overbite”. While a fixed lip slot die typically runs with minimal operator contact, periodically it may be necessary to make a manual adjustment to the lip offset.



Setting the Lip Gap with Shims and Offset Blocks, *continued*

To do so, loosen the body bolts of the die, allowing the upper body to move in relation to the lower body; loosen the offset bolts; and install the desired offset shims. If you are operating the die at an elevated temperature, wait for the die bodies to reach the operating temperature and stabilize before torquing the body or offset bolts. Torque the offset screws to the proper value according to the torque chart in the operation manual. Torquing the screws will pull the upper body back against the shims. This should be done from one end of the die to the other. Finally, torque the body bolts in sequence to the values engraved on the upper body, starting in the center and working toward the die ends, alternating from one side of the center line to the other. Recommended torque levels must be reached and held for a moment to allow the bolts to seat. The torquing procedure should be carried out at least twice to ensure optimal operation.



Body bolts are considered to be replaceable wear parts. Replacement bolts should never be lower-grade or shorter in length, since body bolt breakage could cause operator injury.

**No one knows the ins and outs of your slot die better than us.
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Not having the correct parts when a line is shutdown, preventing goods from being produced, is the stuff of an operation manager's most frustrating nightmare. By ensuring that your organization has the proper materials and tooling for a die shutdown, downtime can be significantly reduced.



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