

THE ONE TWO THREE OF TONNAGE CALCULATION

By Associated Pacific Machine Corp.



Tonnage calculation is not as straightforward as it seems. The rule of thumb APMC goes by is 4" of linear rule per ton of the machine, which is the amount of force it takes to push a steel rule die into a polypropylene cutting pad. In theory, if you have pushed a die into the pad, you have cut the material. The truth is, there is actually a very broad range of calculations. The three main factors are:

- The material itself
- Cutting pad material
- Die rule

Taking the steel rule as a constant, we use straight edge rule cutting into a polypropylene pad as our base. There are a few materials like Kevlar, polycarbonate, and certain plastics that take additional tonnage to cut, and are usually in the 2-3" per ton range. In contrast, we have cut soft foams that are up to 12" per ton. As you can see, everything is material dependent and there is no one universal testing system in order to determine an accurate cut.

In regards to cutting pads, nylon pads are harder than polypropylene, though the same rule of thumb can still be used. There are softer pads like polyethylene and polyurethane that allow for more cutting rule than a polypropylene pad using straight edge rule (the easier to penetrate the pad, the easier to pinch off the material). This applies to soft materials that are pinched off to cut – they only cut at the end of the stroke (polyurethane foam and rubbers are a good example of this).

For die rule, a serrated edge rule can often cut as it goes down as opposed to pinching at the end. There are numerous serration patterns available, though it's important to note that the cut edge can often become ragged, so this is not always a solution (for example, it works well for some PE foams and honeycomb paper). After over 50 years in the business, we know well that choosing the serration pattern is both an art and a science.

There are some other factors at play, such as too much ejection rubber, or ejection rubber that is too stiff. This can result in

machine tonnage being used simply to compress, meaning there is less tonnage available for cutting. The same can be said of thicker or multiple layers of material being cut by short dies – it will take more tonnage just to compress the material.

The best way to determine tonnage is with the customer's actual die and material. Our machines have manometer gauges that tell us how much tonnage the machine is using to compress and cut, and we are happy to test this for our customers. The most important information to start with is the thickness and density of the cut and what rule and rule height are being used. We prefer, if our customer is able, to have them send their die and material for testing. Even if their setup seems pretty standard, we don't want to get caught in an estimate that is not enough, nor do we want to recommend an unnecessary amount of tonnage. Please feel free to reach out to us if you have additional questions, we are here to provide solutions for all of your die-cutting needs.