

# How to select Plastic Injection Moulding Machine 2

Contributed by Administrator  
 Sunday, 30 September 2007  
 Last Updated Sunday, 30 September 2007

## 2.1 Shot weight

Shot weight is an important attribute of the injection unit of a PIMM. Expressed in ounces or grams, this is by far the most commonly used single attribute to select a plastic injection moulding machine. It is not unreasonable to say that it has been abused.

The reason is simple. A moulder has an article at hand to be moulded. Once the plastic material is selected, it has a weight. A PIMM with sufficient shot weight is then selected.

### 2.1.1 Definition of shot weight

The shot weight is the measured (therefore actual) weight of the plastic 'injected' when the nozzle is free-standing (not held against the mould). The plastic used is usually polystyrene with a specific gravity (S.G.) of 1.05. This is specified in the specification as PS.

### 2.1.2 Shot weight in terms of the resin to be used

If the article to be moulded is made of a resin different than PS, then the shot weight in the specification could not be used immediately, but must be calculated as follows: Shot weight in terms of a resin =  $c * b / 1.05$  where  $b = \text{S.G. of the resin}$ ,  $c = \text{shot weight in terms of PS (S.G. = 1.05)}$

Table 2 lists the S.G. of some common resins.

Example 1: POM has an S.G. of 1.42. It is to be moulded in a PIMM with a shot weight of 8 oz (in PS). This machine has a shot weight of

$$8 * 1.42 / 1.05 = 10.8 \text{ oz of POM.}$$

Example 2: PP has an S.G. of 0.86. It is to be moulded in a PIMM with a shot weight of 8 oz (in PS). This machine has a shot weight of

$$8 * 0.86 / 1.05 = 6.6 \text{ oz of PP. An 8 oz. (in PS) PIMM would not have provided the capacity needed by 8 oz. of PP.}$$

Resin	Abbreviation	S.G. at room temperature
General Purpose Polystyrene	GPPS (PS)	1.04 - 1.09
High Impact Polystyrene	HIPS	1.14 - 1.20
Acrylonitrile Butadiene Styrene	ABS	1.01 - 1.08
Acrylonitrile Styrene	AS (SAN)	1.06 - 1.10
Low Density Polyethylene	LDPE	0.89 - 0.93
High Density Polyethylene	HDPE	0.94 - 0.98
Polypropylene	PP	0.85 - 0.92
Plasticized Polyvinyl Chloride (soft)	PPVC	1.19 - 1.35
Unplasticized Polyvinyl Chloride (rigid)	UPVC	1.38 - 1.41
Polyamide-6	PA-6	1.12 - 1.15
Polyamide-66	PA-66	1.13 - 1.16
Polymethyl Methacrylate	PMMA	1.16 - 1.20
Polycarbonate	PC	1.20 - 1.22
Polyoxymethylene (Polyacetal)	POM	1.41 - 1.43
Polyethylene Terephthalate	PET	1.29 - 1.41
Polybutylene Terephthalate	PBT	1.30 - 1.38
Cellulose Acetate	CA	1.25 - 1.35
Polyphenylene Oxide, modified	PPO-M	1.04 - 1.10
Polyphenylene Sulfide	PPS	1.28 - 1.32

Table 2. Specific gravity of resins at room temperature

### 2.1.3 Relation of shot weight to injection volume

Shot weight is not equal to injection volume times the S.G. of PS. Shot weight is measured. Injection volume (see section 2.9) is theoretical. Injection volume times the S.G. of PS provides a higher value than shot weight due leakage pass the screw during injection. Also, the non-return valve at the tip of the screw moves backward a little before it reaches the closed position.

Some manufacturers prefer to use injection volume as the starting point to state the shot weight of their machines, instead of using measured shot weight. See section 2.9