



CLAMPING FORCE & SHOT-SIZE CALCULATION GUIDE

FOR INJECTION MOULDING MACHINES

$$F = P \times A$$



TECHNICAL CALCULATION GUIDE · PRATISHNA ENGINEERS

A step-by-step method for working out clamp tonnage, shot volume and barrel capacity from part and mould data, with material factors, worked examples and a worksheet you can fill in before asking for a machine quotation.

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WHO THIS GUIDE IS FOR

Plant owners, production and process engineers, mould designers and purchase teams who are sizing a new machine or checking whether a new mould will run on an existing one.

HOW TO USE IT

Work through Sections 01 to 06 in order, check mould fit in Section 07, compare your case with Section 08 and record the results in the Section 09 worksheet. Machine type and application fit are covered in the Injection Moulding Machine Selection Guide.

NEED A RECOMMENDATION?

Send the completed Section 09 worksheet, the part drawing and your material grade to **sales@pratishnaengineers.com**. Our team will review the calculation with you.

SECTION 01 · BEFORE YOU CALCULATE

DATA YOU NEED BEFORE CALCULATING

Which part, material and mould details decide clamp force and shot size?

Clamping force and shot size are the first two numbers to settle when a new mould or a new machine is planned. Both come from the part, the material and the mould layout, not from the tonnage of the last machine bought or from part weight alone. A clamp that is too small lets the mould open and flash; a clamp far larger than needed can damage the mould^[2]. A barrel that is too small cannot make the shot, and one that is too large holds melt for too long^[4].

THE CALCULATION SEQUENCE

PART DATA drawing, material	PROJECTED AREA Section 02	CLAMP FACTOR Section 03	CLAMP FORCE Section 04	SHOT VOLUME Section 05	BARREL & PRESSURE Section 06	MOULD FIT Section 07
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INPUTS TO COLLECT BEFORE YOU CALCULATE

INPUT	USUALLY COMES FROM	USED FOR
Part drawing or 3D model	Product designer	Projected area, part depth, wall thickness
Number of cavities	Mould design and output target	Multiplies both the area and the shot
Runner type and size	Mould designer	Cold or three-plate runners add area and shot weight; a hot runner manifold does not add area
Part and runner weight	CAD volume or weighed samples	Shot weight and shot volume
Material and grade	Resin datasheet	Clamp factor, melt density, injection pressure, barrel window
Wall thickness and longest flow length	Drawing or mould flow study	Moves the clamp factor up for thin walls and long flows ^[2]
Gate type, size and number	Mould designer	Also moves the clamp factor ^[2]
Part depth	Drawing	Opening stroke and daylight (Section 07)
Mould size, height and weight	Mould drawing	Tie-bar clearance, shut height, platen load

UNITS USED IN THIS GUIDE

CONVERSIONS

$$1 \text{ US ton} = 0.9072 \text{ t} \quad \cdot \quad 1 \text{ in}^2 = 6.4516 \text{ cm}^2 \quad \cdot \quad 1 \text{ US t/in}^2 = 0.1406 \text{ t/cm}^2$$

$$1 \text{ t (tonne-force)} = 9.81 \text{ kN} \quad \cdot \quad 400 \text{ bar} = 407.9 \text{ kgf/cm}^2 = 0.408 \text{ t/cm}^2 \approx 2.9 \text{ US t/in}^2$$

Clamp force is given in metric tonnes (t). Many published clamp factors are in US tons per square inch, so the conversion is shown next to each figure. Barrel capacity is given in cm³ of swept volume and as grams of polystyrene (PS), the basis most machine shot ratings use^[4].

CLAMP FOLLOWS AREA

Two parts of the same weight can need very different clamp force. A flat lid needs far more than a deep cup with the same weight.

SHOT IS A VOLUME

The screw displaces a volume of melt. Grams only make sense once the melt density of the material is known.

THE ANSWER IS A RANGE

Each calculation gives a band. Wall, flow length, gate and grade decide where in that band the job sits.

Early in a project some inputs will be estimates: a CAD weight instead of a weighed part, or an assumed runner. Use them, mark them as assumptions in the Section 09 worksheet, and repeat the calculation once the mould design is frozen.

SECTION 02 · PROJECTED AREA

MEASURING PROJECTED AREA

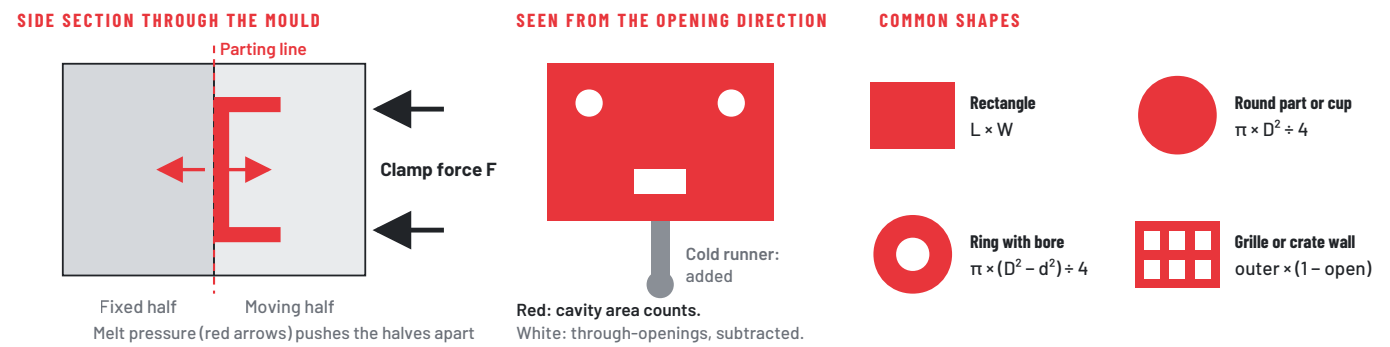
How to work out the area that melt pressure pushes against.

Projected area is the area of the moulding seen from the direction in which the mould opens: the shadow the cavities and runner throw on the parting plane. Melt pressure on this area tries to push the mould halves apart, so every clamp calculation starts here.

PROJECTED AREA OF THE SHOT

$$A_{total} = (A_{part} - A_{through-openings}) \times cavities + A_{cold\ runner\ \&\ sprue}$$

Through-openings are subtracted and the full cold-runner area is added^[2]. With a hot runner the manifold is closed inside the mould, so only the cavities count.



Not to scale. Measure outside size at the parting line, flanges included. A closed cup counts its full diameter; use the CAD projected-area tool for irregular parts.

WHAT TO COUNT AND WHAT TO LEAVE OUT

FEATURE	TREATMENT	REASON
Holes and windows through the part	Subtract	No melt sits there to push on the mould ^[2]
Blind holes, recesses, ribs	Count	Melt pressure still acts on the floor of the recess
Cold runner and sprue on the parting line	Add in full	Filled and packed with the cavities ^[2]
Hot runner manifold	Leave out	Sealed inside the mould; only cavity area counts
Side faces formed by slides	Review	Slide faces load the slide locks, not the main clamp; agree with the mould designer
Stack mould	One face + 10% per level	Both faces share the same clamp line ^[7]

WORKED EXAMPLE: FOUR-CAVITY SWITCH BOX COVER

PROJECTED AREA BUILD-UP		ILLUSTRATIVE EXAMPLE
OUTLINE AND OPENINGS	110 × 75 mm = 82.50 cm ² ; two Ø8 mm screw holes (1.01 cm ²) and a 20 × 10 mm cable cut-out (2.00 cm ²)	
NET PER CAVITY	82.50 – 1.01 – 2.00 = 79.49 cm ²	
TOTAL PROJECTED AREA	4 × 79.49 + 16.0 cm ² assumed cold runner = 334.0 cm² , used again in Sections 04 and 05	
NOTE Illustrative example. Actual requirements depend on the component, material, mould and production conditions.		

SECTION 03 · CLAMP FACTOR

CHOOSING THE CLAMP FACTOR

What clamp factor should be used for each material and part type?

The clamp factor K, also called the tonnage factor, turns projected area into force. Published factors run from about 2 to 8 US t/in² depending on material^[1], and another reference gives 2 to 10 with 3 as a reasonable starting point^[2]. The table brings together published figures. A grade-specific value on the resin datasheet always takes priority.

MATERIAL OR APPLICATION	PUBLISHED FACTOR (US T/IN ²)	METRIC (T/CM ²)	COMMENT
Polyethylene (PE)	Low end of 2 to 8 ^[1]	about 0.28	Easy-flowing; still check thin-wall lids and long flows
Polypropylene (PP)	2 to 3 ^[1]	0.28 to 0.42	Upper end for thin walls and high-cavity moulds
Rigid PVC moulding grades	2 to 2.5 ^[12]	0.28 to 0.35	More for thin walls or long flows ^[12]
ABS (general-purpose grade example)	2 to 4 ^[11]	0.28 to 0.56	Figure from one grade datasheet; check your own grade
Polycarbonate (general grade example)	3 to 5 ^[10]	0.42 to 0.70	High melt viscosity; PC sits toward the top of the range ^[1]
Thin-wall moulding	5 to 8 ^[9]	0.70 to 1.12	Against 3 to 5 for conventional moulding ^[9]
No material data available	400 bar cavity pressure guide ^[1]	0.41	About 2.9 US t/in ² . For nylon, POM, PBT and filled grades use the datasheet

WHAT MOVES THE FACTOR UP OR DOWN

FLOW LENGTH TO WALL

Ratios below 150:1 carry low risk of sinks, short shots or size problems^[2]. Thin-wall parts run at 100:1 to 200:1^[9].

WALL THICKNESS

Thinner walls need more pressure to fill and raise the force on the mould.

GATES

Gate location, gate size and the number of gates all shift the factor^[2].

MELT FLOW

MFI cannot be compared across resin types. PC moulds as a viscous melt at an MFI of 2 or 25^[2].

CAVITY PRESSURE METHOD

WHEN A CAVITY PRESSURE IS KNOWN OR ASSUMED

$$K \text{ (t/cm}^2\text{)} = P_{\text{cavity}} \text{ (bar)} \times 1.0197 \div 1000$$

$$400 \text{ bar} \rightarrow 0.408 \text{ t/cm}^2 \quad \cdot \quad 600 \text{ bar} \rightarrow 0.612 \text{ t/cm}^2 \quad \cdot \quad 800 \text{ bar} \rightarrow 0.816 \text{ t/cm}^2$$

The 400 bar guide is for cases with no material or mould data^[1]. A mould flow study gives a better figure for thin-wall or long-flow parts.

WHAT EACH FACTOR MEANS AS CAVITY PRESSURE

CLAMP FACTOR (US T/IN ²)	2	2.5	3	4	5	8
Metric factor (t/cm ²)	0.281	0.352	0.422	0.562	0.703	1.125
Average pressure on the parting plane (bar)	276	345	414	552	690	1,103

Calculated conversions. Average pressure on the parting plane is lower than the injection pressure at the nozzle because pressure drops along the runner, gate and flow path.

CHOOSING K Start from the grade datasheet. Without one, use the material row above. Move toward the upper end for thin walls, long flow paths, small or few gates and high-viscosity grades, and toward the lower end for thick, short-flow parts in easy-flowing material.

SECTION 04 · CLAMPING FORCE

CALCULATING CLAMPING FORCE

From projected area to a tonnage range, and why bigger is not safer.

CLAMPING FORCE

$$F \text{ (t)} = A_{\text{total}} \text{ (cm}^2\text{)} \times K \text{ (t/cm}^2\text{)} \times S$$

S is a safety margin; this guide uses 1.1 (10% reserve). Another published form uses a safety factor of at least 1.2^[7]. Apply one margin once: a high K plus a large S overstates the need.

WORKED EXAMPLE: SWITCH BOX COVER IN PP

STEP	WORKING	RESULT
Projected area (Section 02)	4 cavities + runner	334.0 cm ²
K for PP, low end	2 US t/in ² = 0.281 t/cm ² , × 1.1	103.3 t
K for PP, mid point	2.5 US t/in ² = 0.352 t/cm ² → 117.4 t, × 1.1	129.1 t
K for PP, high end	3 US t/in ² = 0.422 t/cm ² , × 1.1	155.0 t
Cross-check at 400 bar	0.408 t/cm ² → 136.2 t, × 1.1	149.9 t

Reading the result: about 130 t to 155 t would be evaluated; a thin wall or long single-gate flow points to the upper figure. Illustrative example. Actual requirements depend on the component, material, mould and production conditions.

LARGEST PROJECTED AREA A CLAMP RATING CAN HOLD

CLAMP RATING	K = 2 US T/IN ²	K = 3	K = 4	K = 5
40 t	129 cm ²	86 cm ²	65 cm ²	52 cm ²
50 t	162 cm ²	108 cm ²	81 cm ²	65 cm ²
60 t	194 cm ²	129 cm ²	97 cm ²	78 cm ²
80 t	259 cm ²	172 cm ²	129 cm ²	103 cm ²
100 t	323 cm ²	216 cm ²	162 cm ²	129 cm ²
150 t	485 cm ²	323 cm ²	242 cm ²	194 cm ²
200 t	647 cm ²	431 cm ²	323 cm ²	259 cm ²
250 t	808 cm ²	539 cm ²	404 cm ²	323 cm ²
300 t	970 cm ²	647 cm ²	485 cm ²	388 cm ²
450 t	1,455 cm ²	970 cm ²	727 cm ²	582 cm ²

Calculated as clamp rating ÷ 1.1 ÷ K in t/cm². Scale linearly for other ratings, then run the full calculation.

WHY MORE TONNAGE IS NOT THE SAFE CHOICE

TOO MUCH CLAMP

Over-clamping can crush vents, roll the parting line, break inserts, crack mould blocks and cause burns, short shots and gloss changes. In one case a mould needing about 100 tons, clamped at a 400-ton maximum, split its cavity block^[2]. Excess force can also crack cylinder mounting plates, deform platens and fracture the frame^[1].

TOO LITTLE CLAMP

If the clamp cannot hold the mould shut, melt seeps between mould parts and leaves flash^[14]. Check area, factor and process before raising clamp, then set it to the calculated need.

SECTION 05 • SHOT SIZE

CALCULATING SHOT SIZE

Converting part weight into shot volume and a barrel capacity range.

The shot is everything injected in one cycle: all cavities, the runner and the sprue. Machine shot ratings are usually given in grams or ounces of polystyrene^[4], so a gram figure cannot be read across to another material. The screw displaces a volume, which means the calculation has to be done in volume using **melt density**, not the room-temperature density printed on most datasheets. Confusing the two is a common error^[6].

SHOT SIZE AND BARREL CAPACITY

- 1 Shot weight $W = \text{cavities} \times \text{part weight} + \text{runner weight}$
- 2 Shot volume $V = W \div \rho_{\text{melt}}$
- 3 Add 10% $V' = 1.1 \times V$
- 4 Barrel window $V' \div 0.65 \leq \text{swept volume} \leq V' \div 0.25$
- 5 PS rating $\text{swept volume (cm}^3\text{)} \times 0.945 = \text{grams of PS}$

The 10% covers check-valve leakage and melt uniformity, and the barrel is then sized so the shot uses no more than 65% of it^[4]. A working range of 25% to 65% of barrel capacity is recommended^[3]. Section 06 explains the window.

MELT DENSITIES FROM PUBLISHED SOURCES

MATERIAL	MELT DENSITY (G/CM ³)	SOLID DENSITY (G/CM ³)	SOURCE NOTE
Polystyrene (PS)	0.945	1.04	Reference basis for most shot ratings ^[4] . Another reference uses 0.97 for GPPS ^[6]
Polypropylene (PP)	about 0.74	0.90	0.75 in a second reference ^{[6][4]}
Polycarbonate (PC)	1.02	about 1.20	Melt figure from ^[6] ; solid figure from ^[10]
PET (bottle grade)	1.15	1.335 (amorphous)	Typical figures for preform moulding ^[13]
POM homopolymer	1.17	1.42	An 18% density change from melt to solid ^[15]

For other materials ask the resin supplier or use a mould flow database. Values vary by grade and source, so record the figure used.

WORKED EXAMPLE: SWITCH BOX COVER IN PP

STEP	WORKING	RESULT
Shot weight	$4 \times 28 \text{ g} + 8 \text{ g runner (assumed)}$	120 g
Shot volume	$120 \div 0.74$	162.2 cm^3
With 10% added	162.2×1.1	178.4 cm^3
Barrel swept volume window	$178.4 \div 0.65 \text{ to } 178.4 \div 0.25$	274 to 714 cm ³
Equivalent PS rating	$\times 0.945$	259 to 674 g PS

USABLE SHOT FROM A BARREL RATED 1,000 G PS

MATERIAL	PS	PP	PC	PET	POM
Shot weight within the 25% to 65% window, after the 10% margin	227 to 591 g	178 to 463 g	245 to 638 g	277 to 719 g	281 to 732 g

Calculated from the melt densities above; scale linearly for other ratings. The same volume of PP melt weighs about 22% less than PS melt. Two-shot and multi-component moulds: run steps 1 to 5 for each injection unit and its material, and for the clamp add the projected areas of every station filled in the same cycle.

SECTION 06 · BARREL & PRESSURE

BARREL, SCREW & INJECTION PRESSURE

Is the barrel the right size, and can the screw deliver enough pressure?

THE BARREL UTILISATION WINDOW

BELOW 20% long residence, degradation	20-25%	25% TO 65% · WORKING RANGE recommended for general-purpose screws	ABOVE 65% unmelt, long recovery
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Shots below 20% of barrel capacity sit in the barrel too long and degrade; shots above 65% bring unmelt, poor melt uniformity and long recovery^[4]. Small shots also mean few screw turns, while about 80% of melting energy should come from shear, not heater bands. At large shots, PP and PE can even wear metal off the screw flights^[3].

Resin makers' windows can be tighter: 50% to 75% for one ABS grade^[11], 50% to 80% for rigid PVC^[12], at least 40% for thin-wall work^[9]. Use the stricter figure.

ROUGH RESIDENCE TIME CHECK

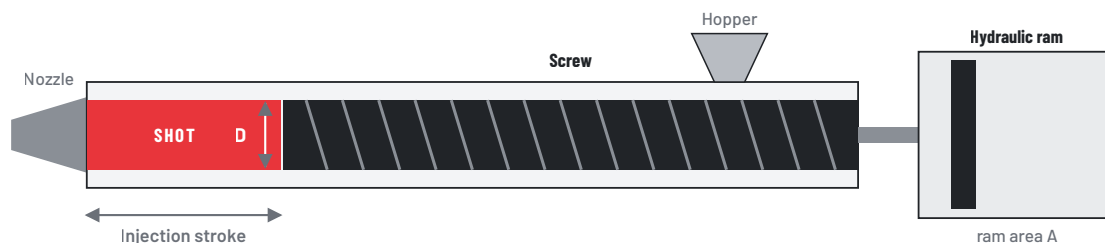
Residence $\approx$ barrel swept volume $\div$ shot volume $\times$ cycle time

Halving the shot on the same barrel and cycle doubles the residence time. Heat-sensitive materials such as rigid PVC and POM deserve this check before a large barrel is chosen^{[12][15]}.

Example: the 162 cm³ switch cover shot at an assumed 30 s cycle: about 132 s on a 714 cm³ barrel, 51 s on a 274 cm³ barrel.

SCREW DIAMETER: SHOT VOLUME AGAINST INJECTION PRESSURE

On the same injection unit, swept volume rises with the square of screw diameter and plastic pressure falls by the same ratio, so the largest screw is not automatically best. A second barrel and screw ordered with a new machine can widen its job range^[4].



$$\text{Swept volume} = \pi \times D^2 \div 4 \times \text{stroke}$$

$$\text{Intensification ratio} = \text{ram area} \div \text{screw area}$$

SCREW DIAMETER, SAME UNIT (CALCULATED)	35 MM	40 MM	45 MM	50 MM
Swept volume, relative (D ² ratio)	0.77	1.00	1.27	1.56
Plastic pressure, relative (1 $\div$ D ² ratio)	1.31	1.00	0.79	0.64

IS THERE ENOUGH INJECTION PRESSURE?

HYDRAULIC MACHINES

Plastic pressure = hydraulic pressure $\times$ intensification ratio

Intensification ratio = hydraulic ram area $\div$ screw area

Ratios on machines in service range from about 6:1 to 43:1 and change with screw size. Electric machines read plastic pressure directly^[5].

PRESSURE DECIDES FILL

A mould that needed 1,585 bar would not fill on a machine giving 1,380 bar, yet filled on one giving 2,014 bar^[5].

CHECK THE DATASHEET

One general PC grade lists injection pressures of 69 to 138 MPa (690 to 1,380 bar)^[10]. Compare the upper figure with the machine at the chosen screw.

THIN WALLS

Thin-wall moulding often needs injection pressures above 30,000 psi (about 2,070 bar) and fill times under one second^[9].

SECTION 07 · MOULD FIT

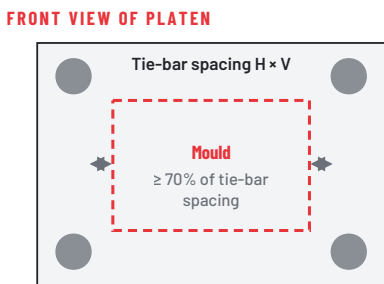
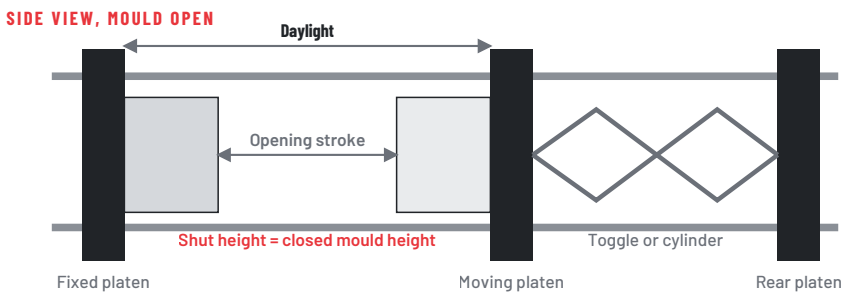
MOULD FIT & PLATEN CHECKS

Will the mould physically fit and run on the machine?

A mould can pass the clamp and shot calculations and still not fit. Compare the mould drawing with the platen and clamp dimensions on the machine specification sheet.

CHECK	RULE OF THUMB	WHAT GOES WRONG IF IT IS MISSED
Tie-bar clearance	Ideally the whole mould fits between the tie bars; at minimum, all part area must lie inside them ^[7]	Platens can pull in near the tie bars and wear the parting line ^[7]
Minimum mould size	Mould should cover at least 70% of the tie-bar spacing ^[8] ; the machine manual gives the minimum	Platens bow, flashing the mould centre; very small moulds can damage platens ^[8]
Shut height	Mould height must be between the machine's minimum and maximum mould height ^[7]	Mould cannot be clamped, or clamp cannot build full force
Opening stroke	At least 2.5 × part height ^[7]	Part or runner cannot drop or be picked out
Daylight	Toggle: max daylight = max shut height + stroke. Piston or two-platen: min shut height + max stroke ^[7]	On piston clamps the stroke left over shrinks as mould height grows
Locating ring	Most moulds use a 101.6 mm (4 in) or 120 mm ring ^[7]	Nozzle and sprue misalign
Mounting and ejector patterns	Check the platen hole pattern (SPI, EUROMAP) and ejector positions ^[7]	A mismatch may need an ejector box or adaptor plates ^[7]
Mould weight	Check the allowed mould weight for both platens ^[7]	Platen sag, guide wear, misalignment
Platen parallelism	0.025 to 0.05 mm is generally acceptable on machines under 500 t ^[7]	Uneven parting-line contact and local flash
Dry cycle	About 1 to 2.5 s for thin-wall work and 3 to 5 s otherwise ^[7]	Clamp movement limits output on fast jobs

CLAMP UNIT DIMENSIONS TO CHECK



NOZZLE, INJECTION UNIT AND TABLE FIT

NOZZLE PRESSURE Machine nozzle pressure is typically up to about 140 MPa, with some machines reaching 200 MPa^[7]. Compare this with the pressure the mould needs from Section 06, at the screw size you plan to use.	VERTICAL & INSERT MACHINES The calculation is the same. With a shuttle table, one upper half serves two lower halves and only the half under the clamp is moulded while the other is loaded^[16], so size clamp and shot for one station. Check the table's mould weight limit too.	THIN-WALL CLAMPS Machines built for thin-wall work tend to have fast, accumulator-assisted clamp movement and extra-thick platens; on better machines the ratio of tie-bar distance to platen thickness is 2:1 or less^[9].
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SECTION 08 · WORKED EXAMPLES

WORKED CALCULATION EXAMPLES

Three moulds, three different deciding factors.

Three engineering illustrations with assumed inputs, not customer case studies. Each shows how the same method gives a different deciding factor. Illustrative example. Actual requirements depend on the component, material, mould and production conditions.

A · PP BUCKET LID, 1 CAVITY, HOT RUNNER		ENGINEERING ILLUSTRATION · ASSUMED INPUTS
INPUTS	Ø250 mm lid, PP, assumed part weight 220 g, hot runner so no runner area	
PROJECTED AREA	$\pi \times 25.0^2 \div 4 = 490.9 \text{ cm}^2$	
CLAMP FORCE	$K = 2 \text{ to } 3 \text{ US t/in}^2\text{[1]}, \times 1.1 \rightarrow \mathbf{151.9 \text{ to } 227.8 \text{ t}}$	
SHOT AND BARREL	$220 \div 0.74 = 297.3 \text{ cm}^3; +10\% = 327.0 \text{ cm}^3$; swept 503 to 1,308 $\text{cm}^3 = \mathbf{475 \text{ to } 1,236 \text{ g PS}}$	
EVALUATE Thin lid rims and a long flow from a centre gate point toward the upper clamp figure. The mould for a 250 mm part also needs a generous tie-bar clearance.		
STILL NEEDED Wall thickness, flow length from the gate, grade MFI and the weighed part.		

B · PC ENCLOSURE, 2 CAVITIES, COLD RUNNER		ENGINEERING ILLUSTRATION · ASSUMED INPUTS
INPUTS	120 × 90 mm, 8 cm ² of through-openings per part, assumed 85 g per part and 20 g runner on 14 cm ²	
PROJECTED AREA	2 × (108 – 8) + 14 = 214 cm ²	
CLAMP FORCE	K = 3 to 5 US t/in ² ^[10] , × 1.1 → 99.3 to 165.5 t	
SHOT AND BARREL	190 ÷ 1.02 ^[6] = 186.3 cm ³ ; +10% = 204.9 cm ³ ; swept 315 to 820 cm ³ = 298 to 775 g PS	
EVALUATE PC needs high injection pressure (69 to 138 MPa for one general grade ^[10]), so the available pressure at the chosen screw decides as much as the clamp does.		
STILL NEEDED Exact grade and any flame-retardant rating, wall thickness, gate design, cosmetic standard.		

C · PET PREFORMS, 16 CAVITIES, HOT RUNNER		ENGINEERING ILLUSTRATION · ASSUMED INPUTS
INPUTS	Ledge (projected) Ø33 mm, 18 g preform, hot runner	
PROJECTED AREA	16 × 8.55 = 136.8 cm ²	
CLAMP FORCE	400 bar guide ^[1] × 1.1 → 61.4 t; cautious 5 US t/in ² × 1.1 → 61 to 106 t	
SHOT AND BARREL	288 g ÷ 1.15 ^[13] = 250.4 cm ³ ; +10% = 275.5 cm ³ ; swept 424 to 1,102 cm ³ = 401 to 1,041 g PS	
EVALUATE Clamp is not the limit. Injection at about 10 to 12 g/s per cavity ^[14] means 160 to 192 g/s, and the barrel must avoid long residence.		
STILL NEEDED Preform drawing, neck finish, cycle target, drying set-up and mould platen size.		

WHAT DECIDED THE MACHINE IN EACH EXAMPLE

EXAMPLE	CLAMP RANGE	BARREL WINDOW (PS)	DECIDING FACTOR
A · PP lid	152 to 228 t	475 to 1,236 g	Projected area and flow length
B · PC enclosure	99 to 166 t	298 to 775 g	Injection pressure at the chosen screw
C · PET preforms	61 to 106 t	401 to 1,041 g	Injection rate, residence time, platen size

SECTION 09 • WORKSHEET

CALCULATION WORKSHEET & COMMON MISTAKES

A one-page record of your calculation, and the errors to avoid.

Fill in one worksheet for each mould. The completed sheet, the part drawing and the grade name are enough for a first review of machine fit.

ITEM	HOW TO GET IT	UNIT	YOUR VALUE
01 Projected area per cavity	outline – through-openings	cm ²	
02 Total projected area	× cavities + cold runner	cm ²	
03 Clamp factor K	datasheet or Section 03 × 0.1406	t/cm ²	
04 Clamp force	area × K × 1.1	t	
05 Shot weight	cavities × part + runner	g	
06 Melt density	Section 05 or resin supplier	g/cm ³	
07 Shot volume + 10%	weight ÷ melt density × 1.1	cm ³	
08 Barrel window	÷ 0.65 to ÷ 0.25, then × 0.945	g PS	
09 Injection pressure needed	datasheet or flow study	bar	
10 Mould size, height, weight	mould drawing (Section 07)	mm, kg	

COMMON CALCULATION MISTAKES

MISTAKE	EFFECT	CORRECTION
Using solid density for shot volume	Shot volume is understated and the barrel comes out too small	Use melt density ^[6]
Reading a PS gram rating as PP grams	The barrel looks about 28% larger than it is for PP	Convert through volume (Section 05) ^[4]
Leaving out the cold runner	Area and shot both understated	Add the full runner and sprue area ^[2]
Counting a hot runner manifold	Clamp overstated	Count cavity area only
Not subtracting through-openings	Clamp overstated for grilles, frames and crates	Subtract openings that pass through the part ^[2]
Comparing MFI across materials	Wrong clamp factor for viscous resins	Use the factor for the resin family and grade ^[2]
Choosing the largest clamp available	Crushed vents, mould damage, wasted power	Size to the calculation and set clamp to need ^[2]
Choosing the largest screw available	Lower plastic pressure, long residence	Keep the shot within the window ^[4]
Checking tonnage but not platen fit	Mould does not fit, or flashes in the centre	Work through Section 07 ^[8]

BEFORE SENDING AN ENQUIRY

Attach the part drawing or model, the material grade and datasheet, cavities and runner type, the target cycle or annual volume, and the mould drawing if it exists.

WHEN TO RUN A FLOW STUDY

Thin walls, long flow paths, multi-gate parts and new high-cavity moulds justify a mould flow study for cavity pressure before the clamp is fixed.

SECTION 10 · TECHNICAL CONSULTATION

TECHNICAL CONSULTATION

Have your calculation reviewed before the machine is specified.

Pratishna Engineers is a Mumbai-based injection moulding machine manufacturer with 35+ years of experience, 9,000+ machines supplied and 1,000+ customers in India and international markets. Design, manufacturing, assembly, testing and service are done in-house, with applications across automotive, packaging, electrical & electronics, medical, consumer, agriculture and industrial sectors.

35+

YEARS

1,000+

CUSTOMERS

9,000+

MACHINES

In-house

DESIGN TO SERVICE

OUR TECHNICAL APPROACH

COMPONENT part drawing	MATERIAL grade & data	MOULD cavities, runner	PRODUCTION cycle, volume	MACHINE CONFIGURATION clamp, shot, screw
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SEND YOUR COMPONENT & PRODUCTION REQUIREMENTS

Share the Section 09 worksheet, part drawing and material grade, and we will review it.

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