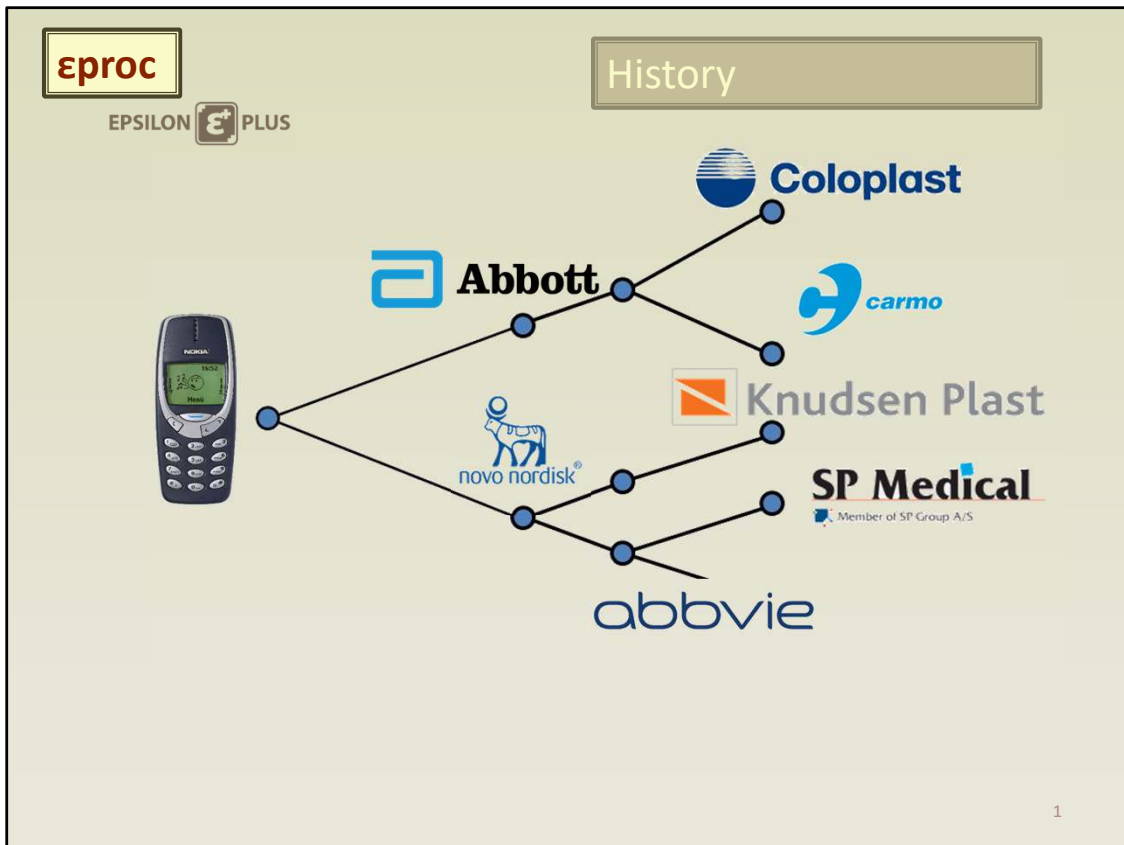




EPROC

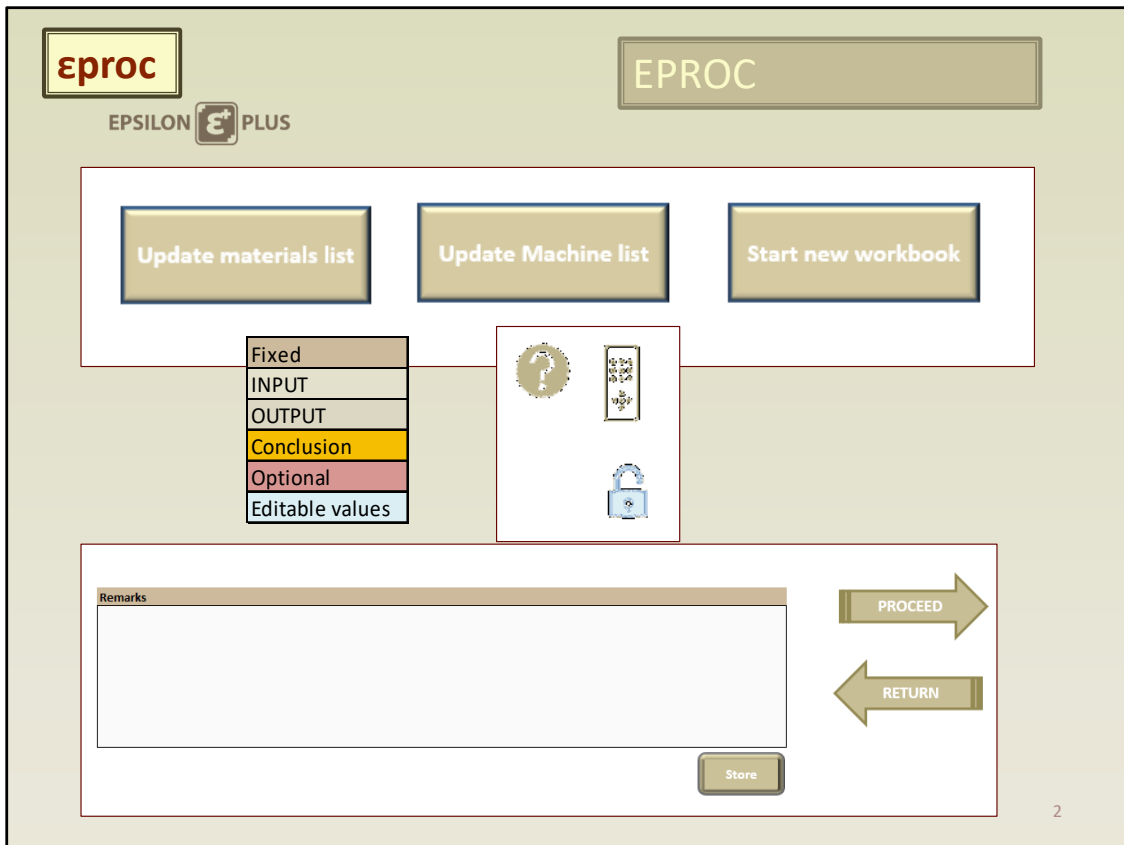
YOUR TOOL FOR SCIENTIFIC MOULDING

BY EPSILONPLUS



Today, several companies (probably inspired by Nokia), apply the method of Scientific Moulding, and use software like EPROC as a tool. EpsilonPlus has developed several of these solutions.

Products from a robust process do not change quality if the process changes, that is why the primary focus with EPROC is to *obtain a robust process* using Scientific Moulding principles



EPROC can be installed with your customized material-data and machine-list, which can easily be updated and maintained with new information. EPROC is easy to use with navigation tools and built-in guides.

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Base Line

Product data

Part:

Product/group/customer:

Flow length: mm

Wall thickness: mm

Tool data

No. Of cavities:

No. Of HR zones:

Expected cycle: sec.

Runner volume: ccm

Runner weight: g

Shot weight: g

Process units

Screw rotational speed:

Shot size:

Decompression:

Material data

Type:

Name:

HDT: °C

Max shear: sec.⁻¹

Recom.:

Mould: °C

Screw speed: mm/s

Melt Temperature: °C

Machine data

Name/number:

Make & Model:

Screw diameter: mm

Dry Cycle: hour⁻¹

Work book information

Purpose:

Project:

Estimates

Parameter	Value	Unit
Screw rotational speed	100	m/min
Shot size	1	mm
Decompression	1	mm
Screw speed	750	mm/s
Melt Temperature	215	°C
Mould Temperature	40	°C
Dry Cycle	2400	hour ⁻¹

Actual setting

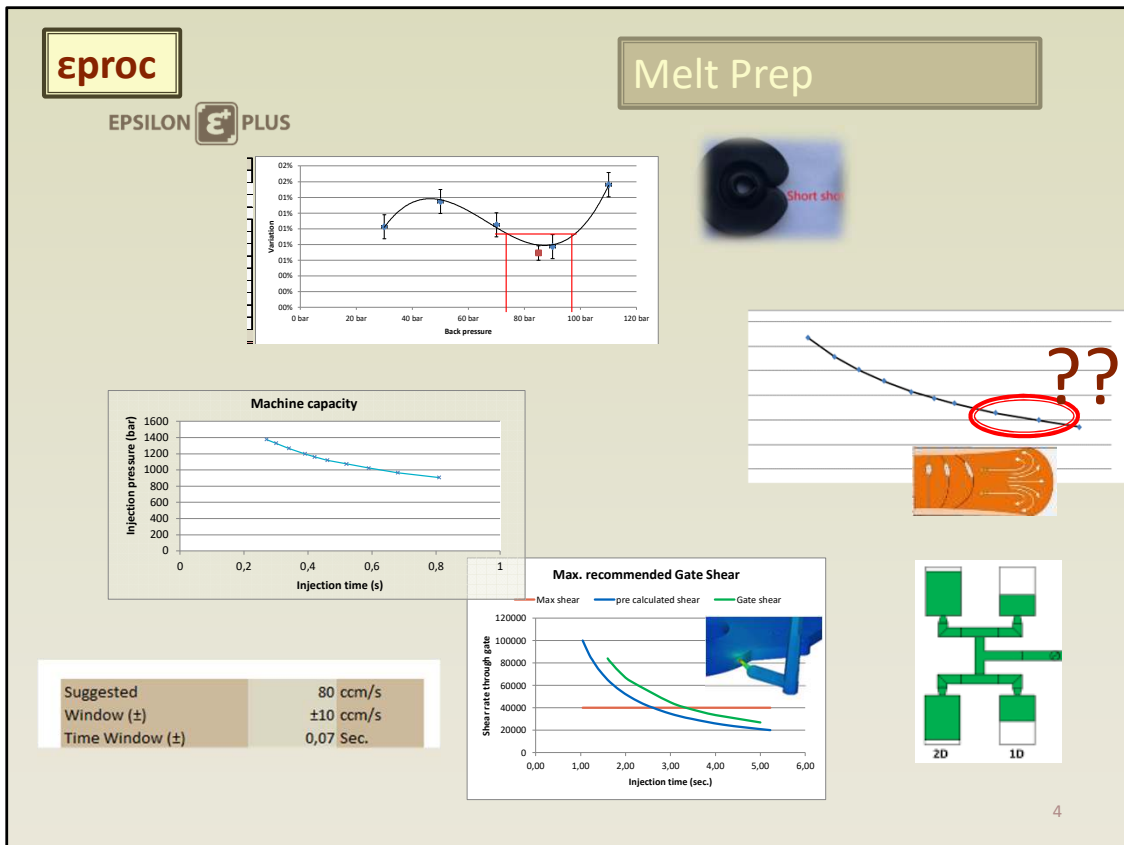
Scientific Moulding is based on knowledge about each material's thermal and viscous properties.

In EPROC you select your machine, your material and enter specification for your tool.

With different options for your process set up you can use EPROC for FOT, validation or as an improvement tool for existing processes.

Estimates for an initial process setting are calculated from tool-, machine- and material data in base line

This will help set up process and it makes it possible to apply the same starting point for tools at multiple sites.



A repeatable homogenous melt is a prerequisite for product- and process stability
 Optimization of the back pressure at the recommended temperatures and screw speed will provide the best possible starting point before filling the cavities
 Injection speed optimization is guided through a viscosity analysis of the specific material.
 Supplementary information about machine capacity and gate shear will help you make the right decision about the optimal speed.
 A large cavity imbalance can be sign of tooling problems, EPROC helps you with the evaluation.

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Hold (pack) phase

Suggested Pack pressure:	200 bar
Optimized Pack pressure:	300 bar
Window	

Pack & Hold

Pack profile

Pack only

Gate seal analysis

Pack time (sec)	Shot weight (g)	Cushion (mm)
00 sec	3.42	8.5
01 sec	3.45	8.0
03 sec	3.48	7.5
04 sec	3.50	7.0
05 sec	3.52	6.5
06 sec	3.54	6.0
07 sec	3.55	5.5
08 sec	3.55	5.0

Hold pressure analysis

Hold pressure (bar)	Shot weight (g)
0 bar	3.42
50 bar	3.45
100 bar	3.48
150 bar	3.50
200 bar	3.52
250 bar	3.54
300 bar	3.55

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The correct packing is critical for dimensions and the shape (warpage) of the final part. In EPROC you will get guidance towards selection of pressure and gate freeze time. Additionally, you have the options to apply either a Pack & Hold (useful for polyolefines) or a packing-profile (useful for side-gated parts). Like the packing phase, EPROC will guide you through the optimization of either of these two options.

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Process window

Process window	Low	Nominal	High
Barrel temp.	222 °C	215 °C	208 °C
Cooling time	4,5 sec	5,0 sec	6,2 sec
Pack time end	1,0 sec	1,0 sec	1,0 sec
Pack pressure	200 bar	300 bar	400 bar
Injection speed	60	80	100
Water temp.	16 °C	16 °C	16 °C

Nominal
8 test runs
Nominal

run	Pack pressure	Cooling time	Barrel temp.	Pack time end	Injection speed	Water temp.
1 (nominal)	300 bar	5,0 sec	215 °C	1,0 sec	80	16 °C
2	200 bar	4,5 sec	222 °C	1,0 sec	100	16 °C
3	400 bar	4,5 sec	222 °C	1,0 sec	60	16 °C
4	200 bar	6,2 sec	222 °C	1,0 sec	100	16 °C
5	400 bar	6,2 sec	222 °C	1,0 sec	60	16 °C
6	200 bar	4,5 sec	208 °C	1,0 sec	60	16 °C
7	400 bar	4,5 sec	208 °C	1,0 sec	100	16 °C
8	200 bar	6,2 sec	208 °C	1,0 sec	60	16 °C
9	400 bar	6,2 sec	208 °C	1,0 sec	100	16 °C
10 (nominal)	300 bar	5,0 sec	215 °C	1,0 sec	80	16 °C

Time effect	0,4%	0,033	DOE succesful
Pack pressure	0,0%		
Cooling time	0,5%	-0,048	
Barrel temp.	0,0%		
Hold time start	0,0%		Irrelevant, not tested
Injection speed	0,0%		
Water temp.	0,0%		Irrelevant, not tested

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A predetermined DOE with potentially significant parameters will help you to determine a valid process window.