EPS Foam Plant

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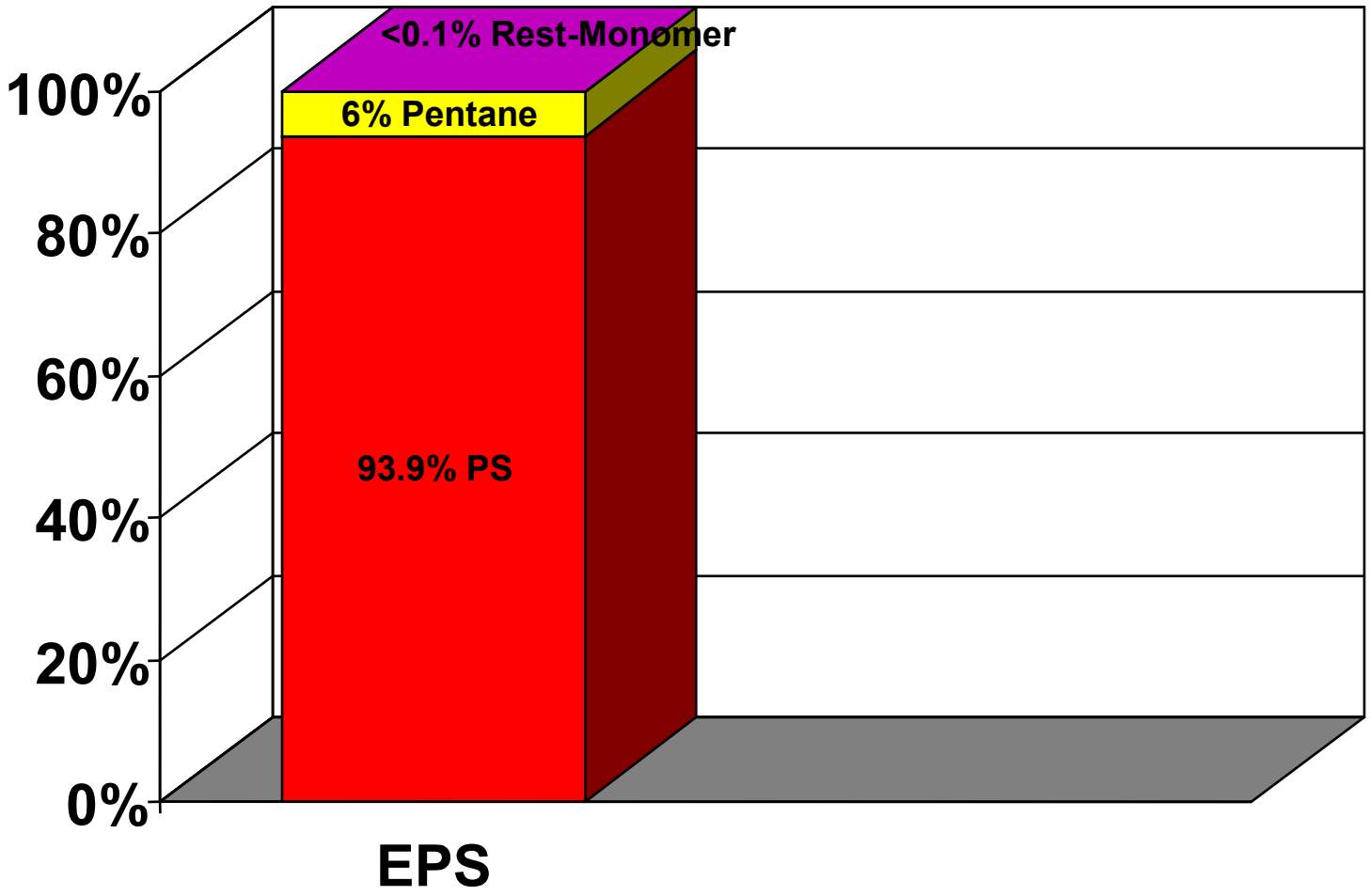
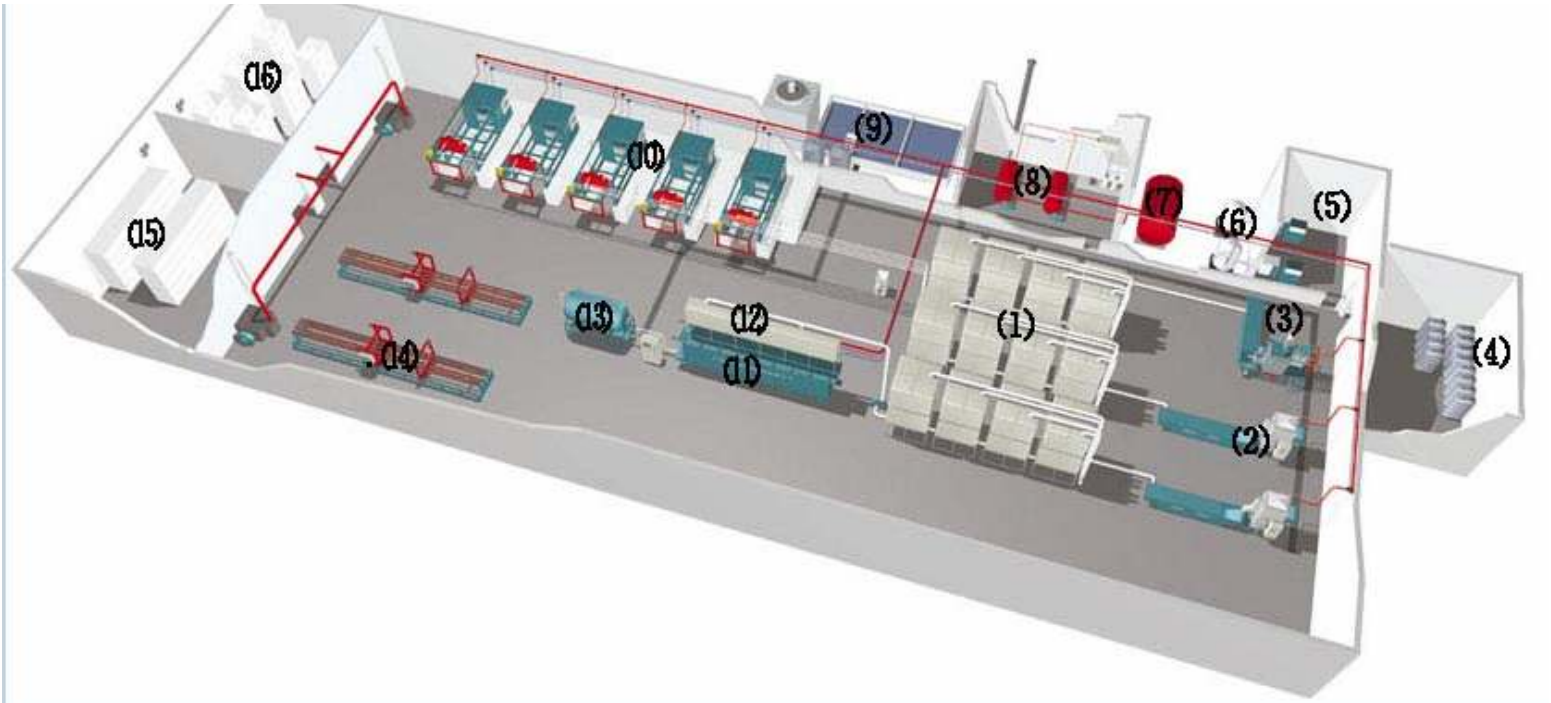
EPS Processing

- **Pre-expansion**
  - The Pre-expansion phase of manufacturing is simply the swelling of the small bead to almost 50 times its original size through heating and rapid release of the gas from the bead during its glass transition phase.
- **Aging**
  - After the expanded beads have been dried they are blown into large open storage bags for the aging process. The beads have been under a dynamic physical transformation that has left them with an internal vacuum in the millions of cells created.
- **The Molding Process**
  - After the aging is finished, the beads are then ready for molding into blocks. Since this is a confined environments, the only way the beads can expand is to fill up any voids between them causing the soft surfaces to fuse together into a polyhedral type solid structure.
- **Shape molding machines**
  - Expanded bead fills the mold cavity via pneumatic filling tubes. The mould walls are also equipped with holes to connect the mold with the steam chamber. Steam is applied to the EPS bead filled cavity of the mold. The steam causes the beads to soften again and to expand. The expansion pressure (around 1 bar) compresses the beads against each other and at the same time forces them against the mold walls so that they fuse together. The resultant part is then cooled by spraying water onto the mould and by applying a vacuum. When cooled down sufficiently, the final molded part can be taken from the mould.
- **Curing**
  - Heating curing is the next step of our process. This not only accelerates the curing process of the freshly molded blocks, but also assure that the material is dimensionally stable and provides a completely, dry material for best fabrication results.

Material Ingredients



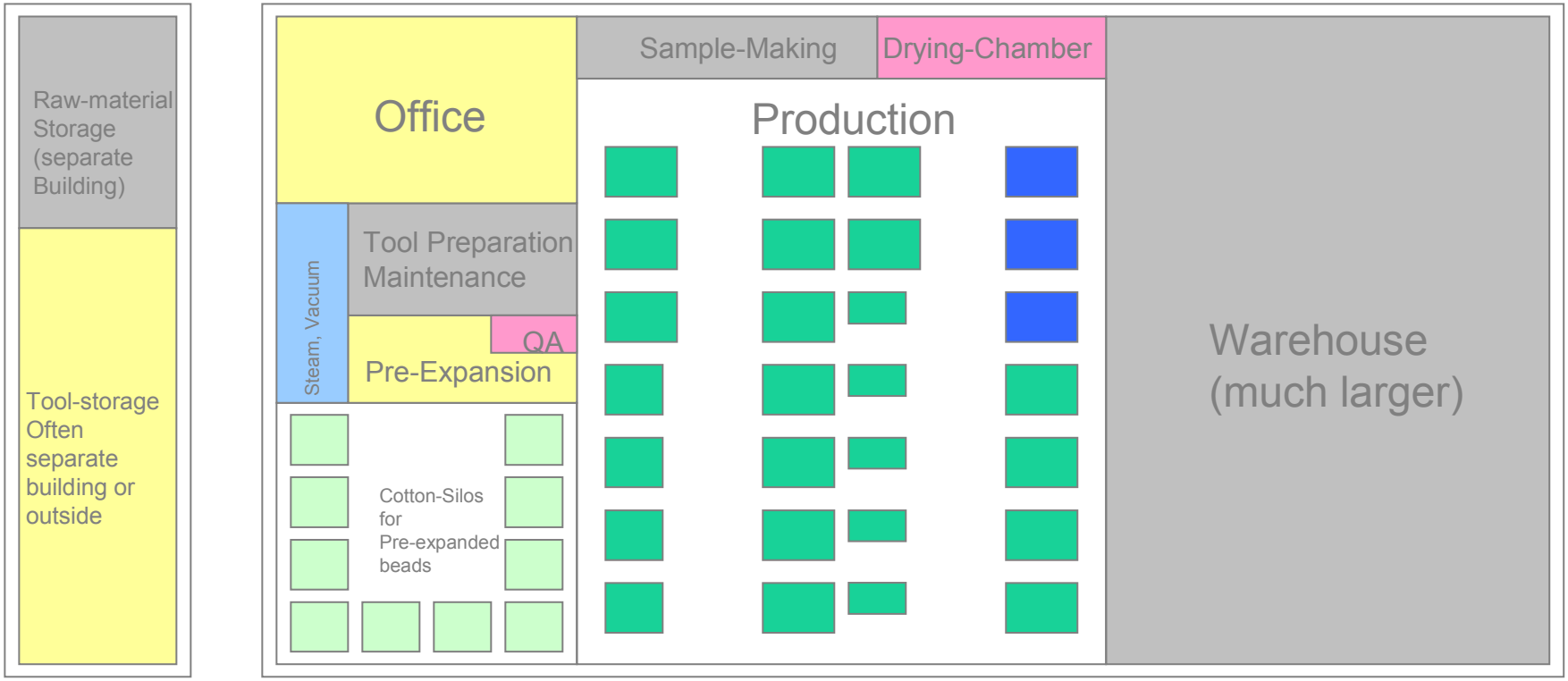
1. Infrastructure - $2.0 million (boiler, pipes, material storage, pentane destruction, drying/curing ovens)
2. Molding Machines: between $200,000 - $400,000 each,
3. Operating the plant: unless you have about the equivalent of $500,000/month in coolers being produced the plant won't make money.



1.aging silo	2.YF-900 continuous pre-expander	3.JF-1200C batch pre-expander	4.raw material storeroom	5.boiler room	6.steam storage tank
7.air -compressed storage tank	8.air compressor and drier	9.pond and cooling tower	10.ZC-1400 automatic vacuum shape molding machine	11.block silo	12,hydraulic pressure atation
13,hydraulic pressure atation	14.vacuum tank	15.QGH-600block	15.blocksdrying room	16. shapes drying room	

http://usa.foameps.com/english/layout.asp

Typical EPS Molder Plant (Base-Functions)



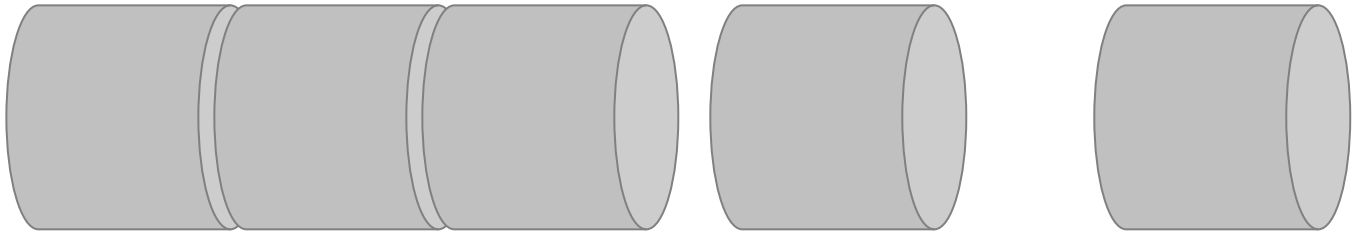
Example:

Revenue:	$20 Million
Employees:	150
Size:	30.000 m²
Machines:	38 EPS + 8 EPP
Annual Weights:	3500 tons EPS, 400 tons EPP
Others:	approx. 30 Mio. Parts/Year, 720.000 m³ Volume

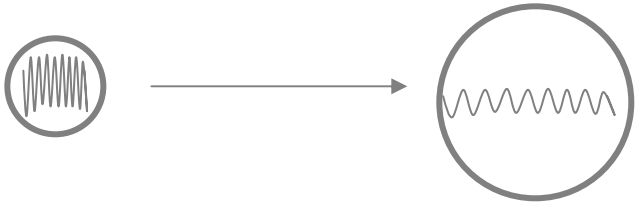
Returned-EPS Recycling Centers, Usually outside	Old-EPS Shredder

Pre-expander

Principle of Bead Expansion and Bead-Fusion

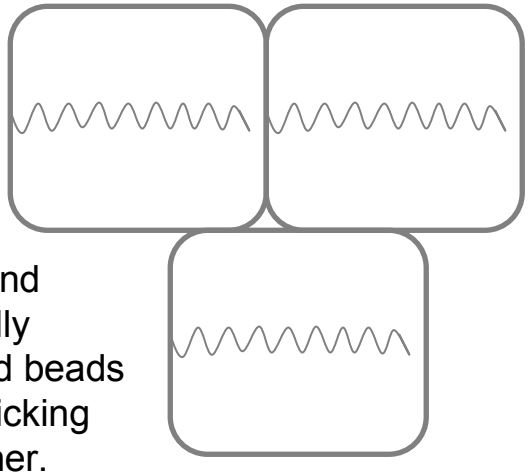


Theoretical shape of a bead, cut at the end of an extruder (at raw-material vendors like BASF). The extruder is permanently pressing the hot, liquid and pressurized mixture of polystyrene and liquid PENTANE in cooling channels, in which the material is cooling down and turning into solid spaghetti, then cut into little cylinder shaped pieces. The gas Pentane is thereby kept in the solid PS and cannot expand, only if the PS is softened by the impact of heat.



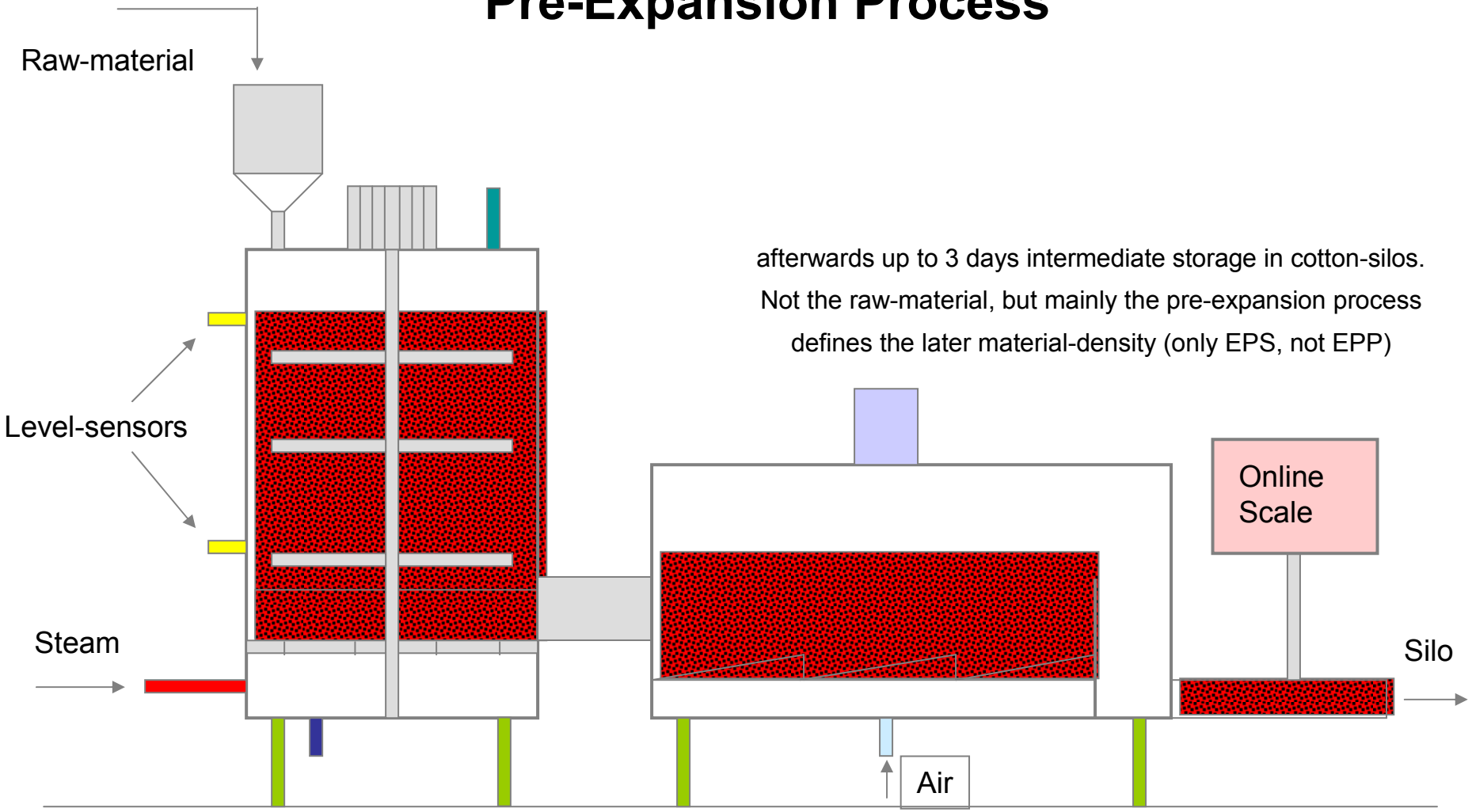
To explain the principle: a compressed spring inside a rubber-ball

The impact of heat is softening the rubber ball allowing the spring to expand. The happens as well in the pre-expander and later again within the tool. Pre-expansion is required, because the tiny raw-material pieces would cause problems in the material injection process.



Soft and partially melted beads are sticking together.

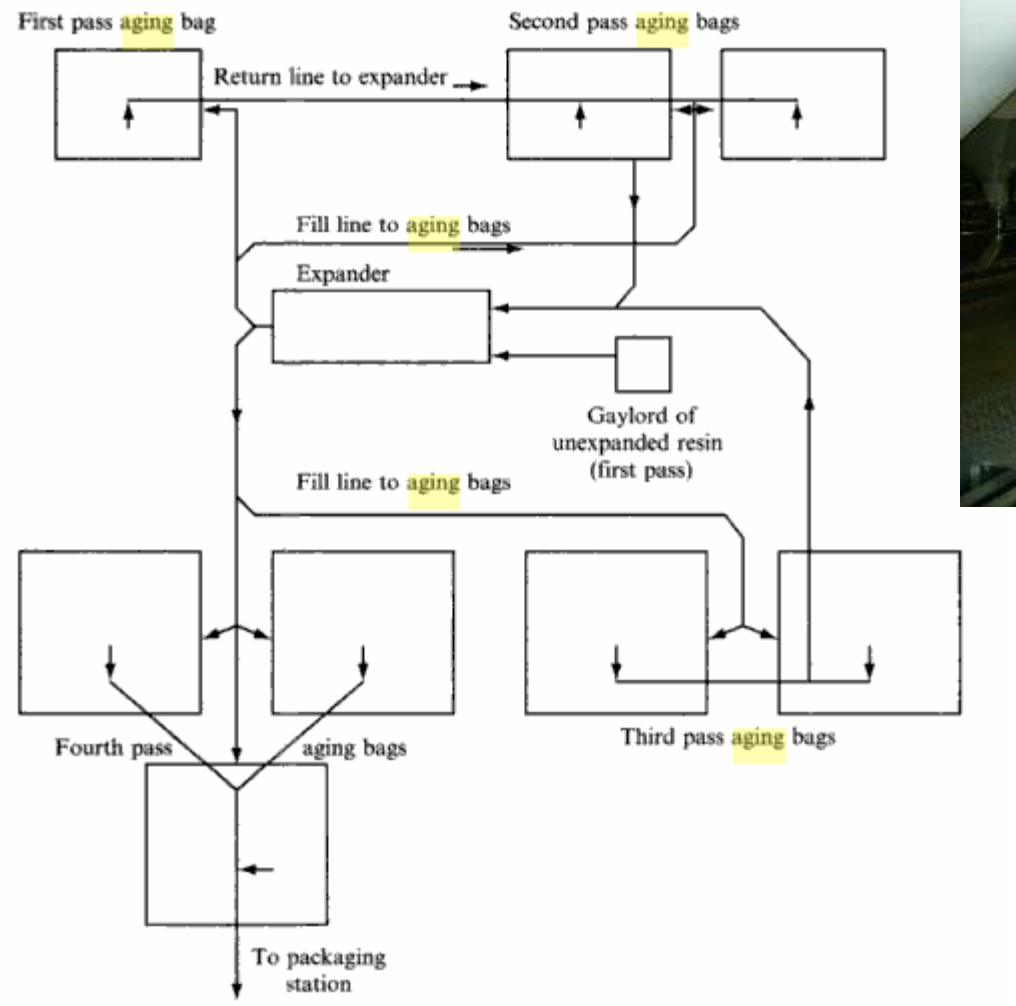
Pre-Expansion Process



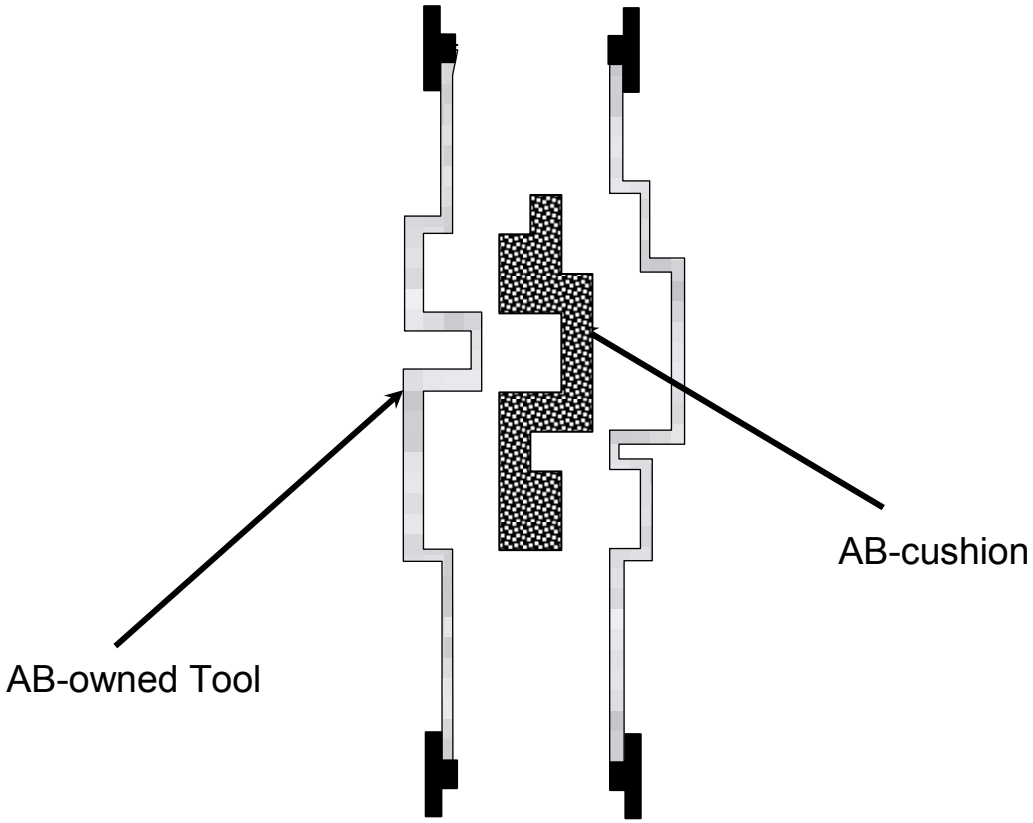
afterwards up to 3 days intermediate storage in cotton-silos.
Not the raw-material, but mainly the pre-expansion process
defines the later material-density (only EPS, not EPP)

Pre-expander (batch)

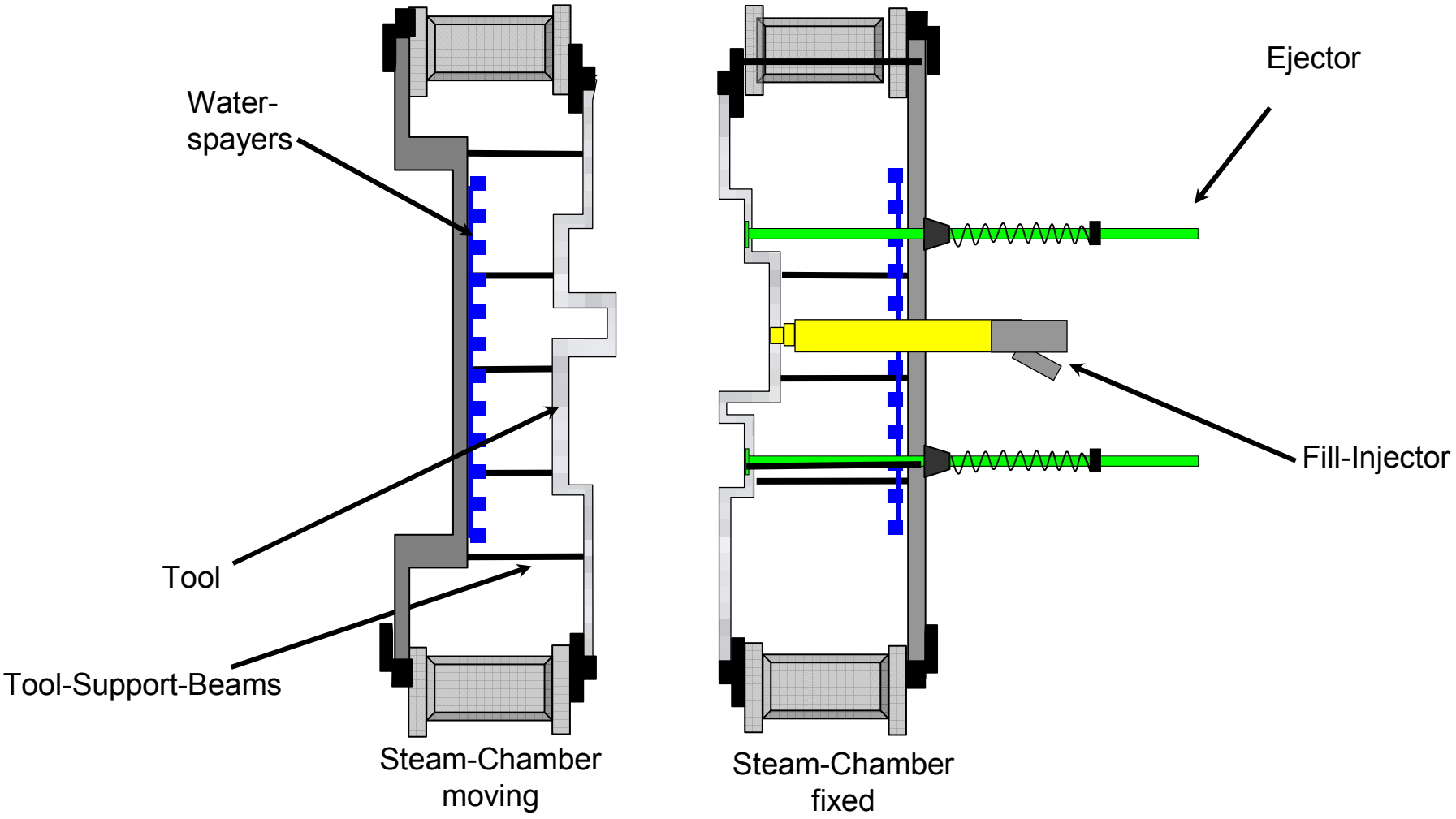
Aging process

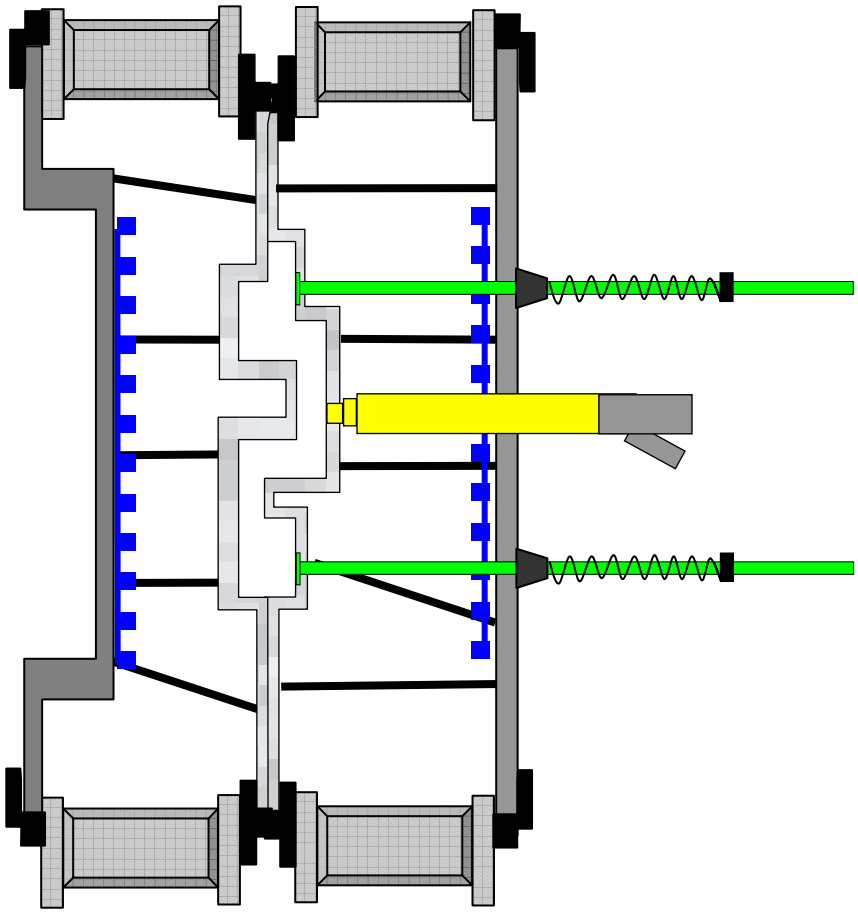


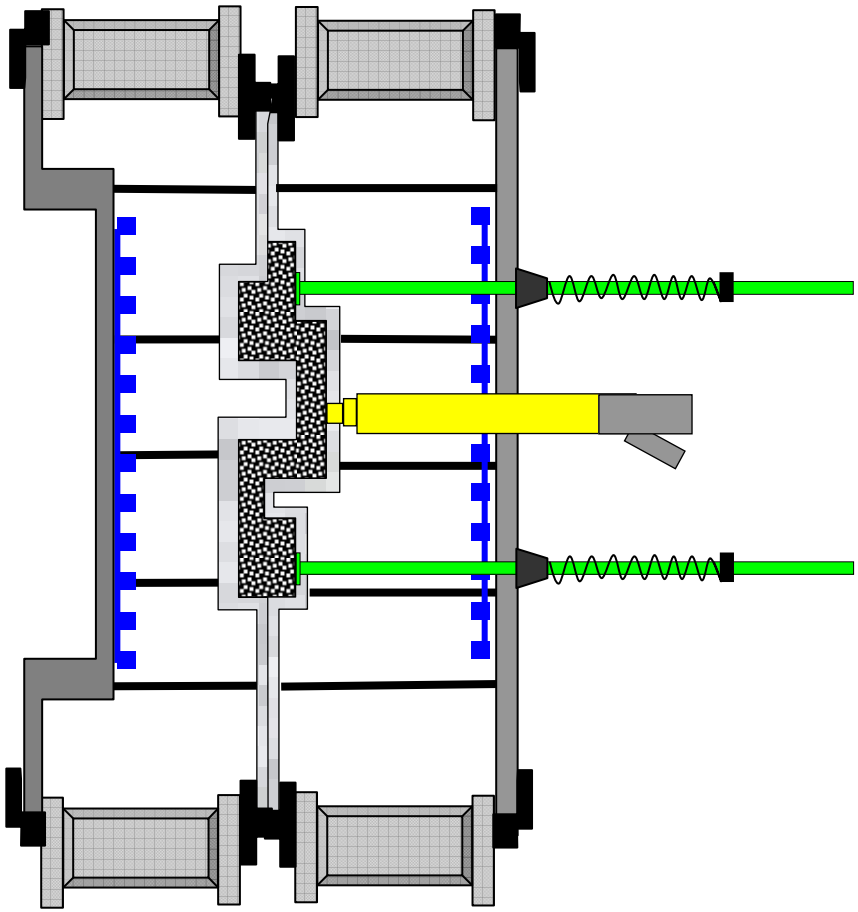
AB‘s Tool, the Part, Molding

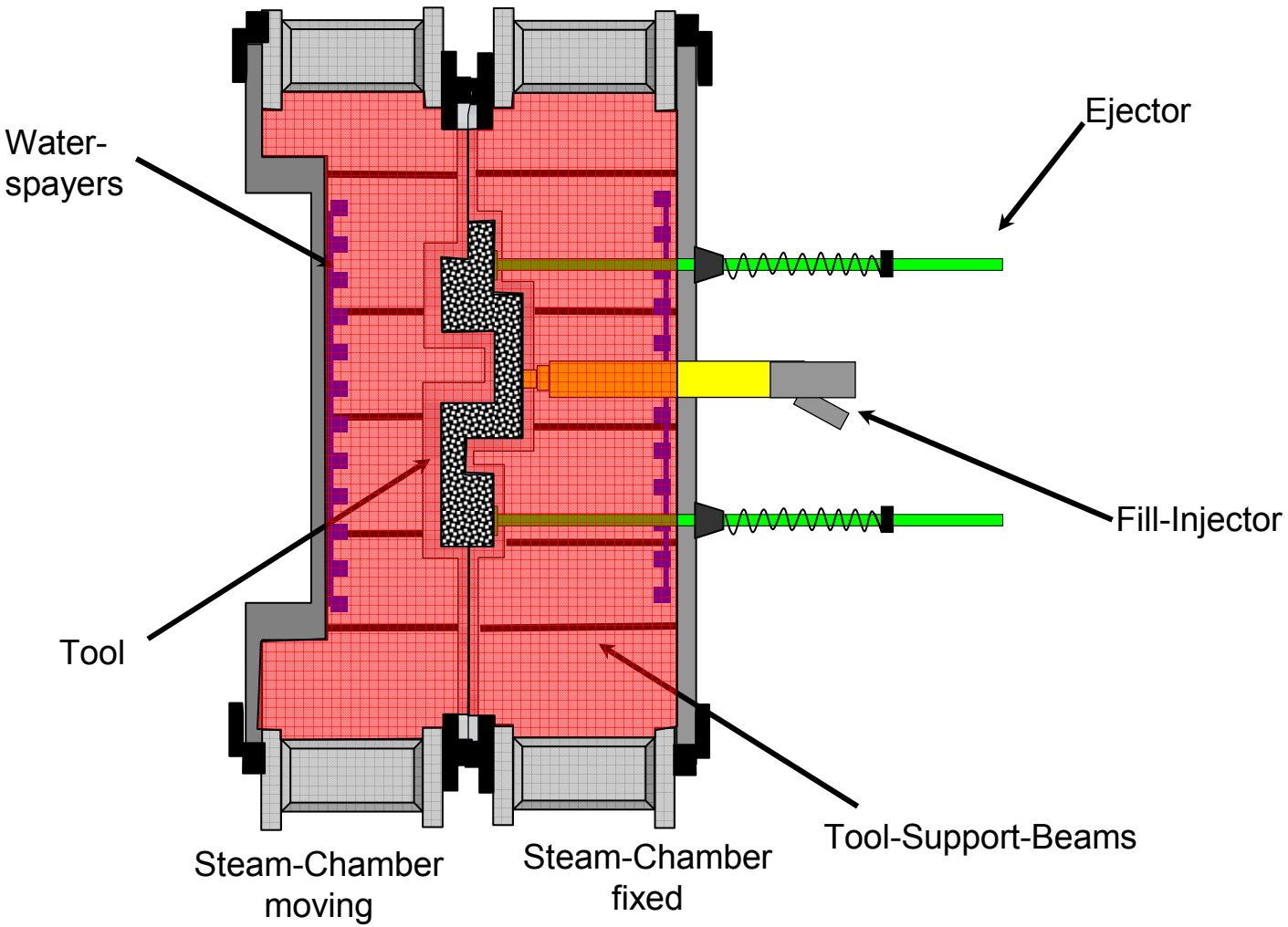


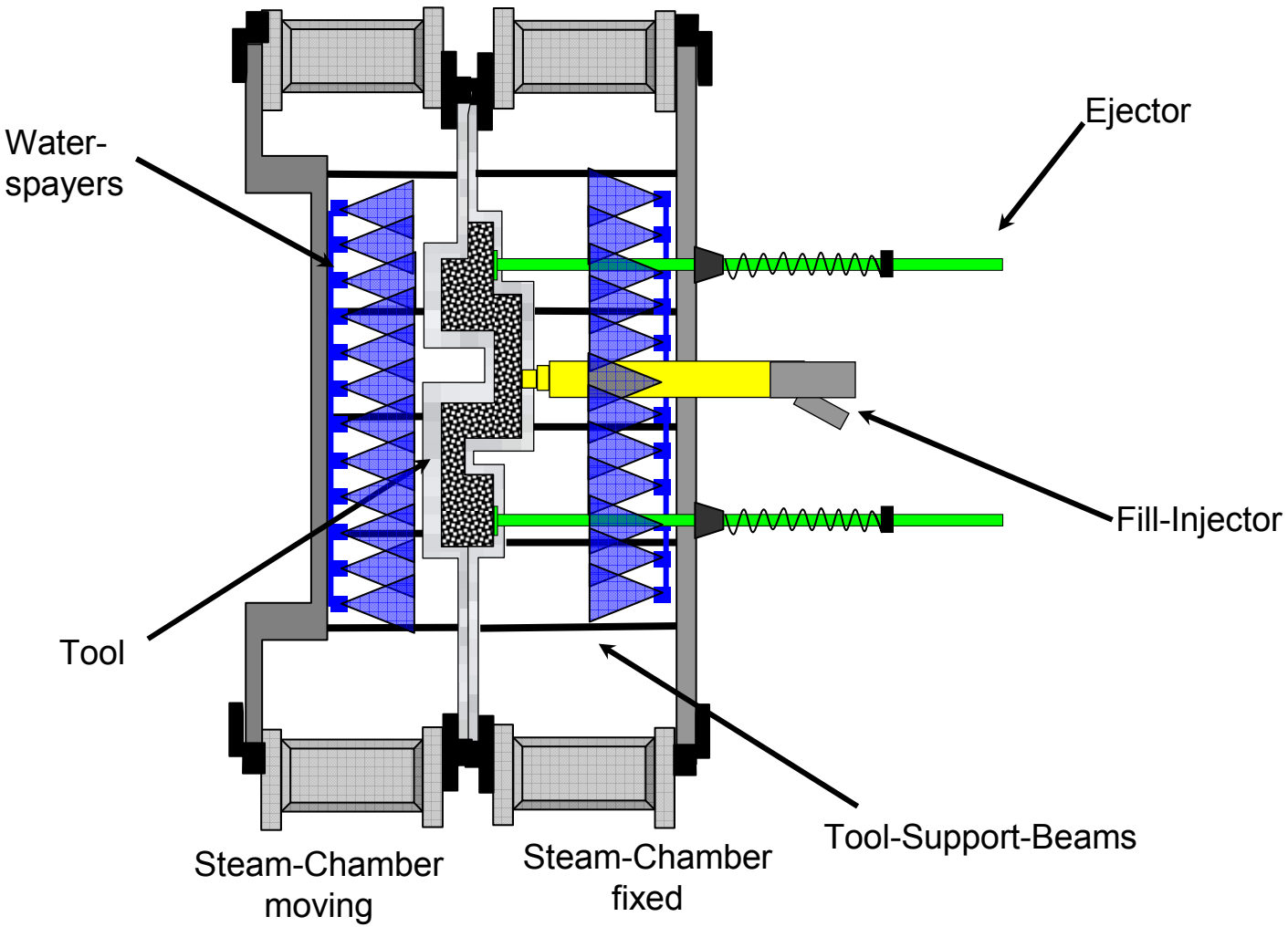
Molding Process Steps








Water-
spayers
Ejector
Fill-Injector
Tool
Tool-Support-Beams
Steam-Chamber
moving
Steam-Chamber
fixed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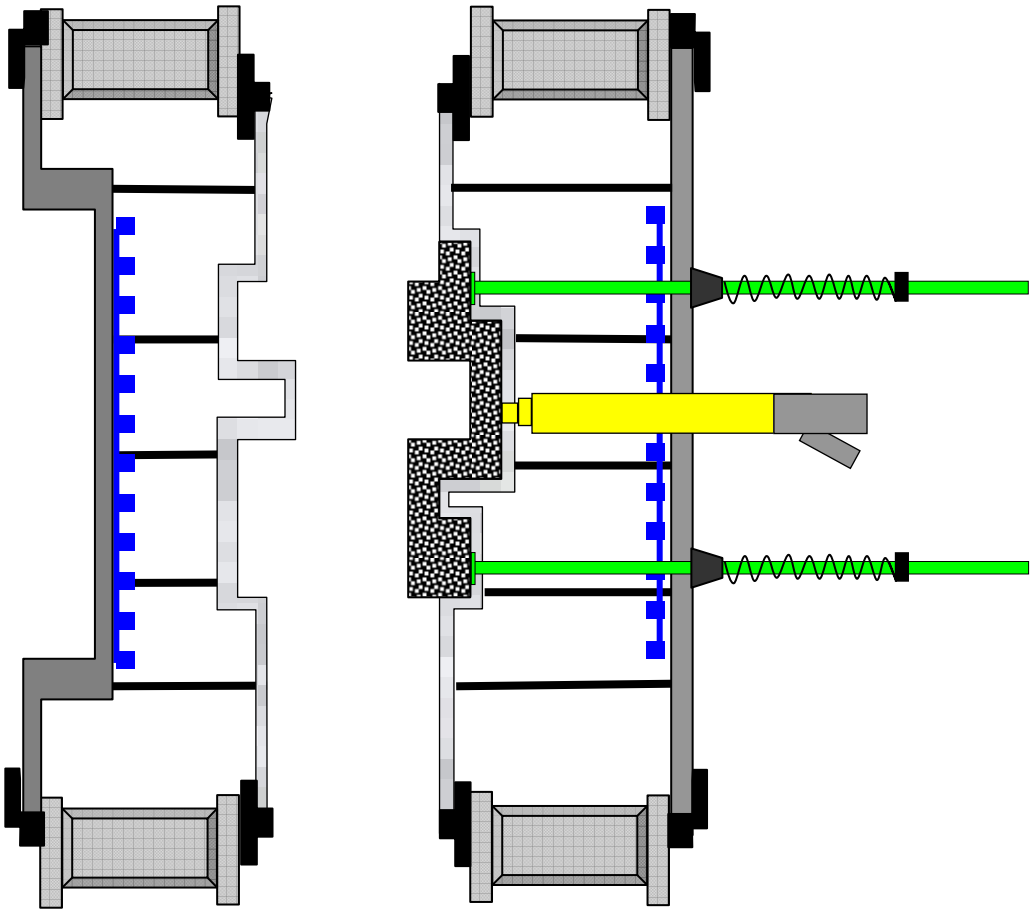
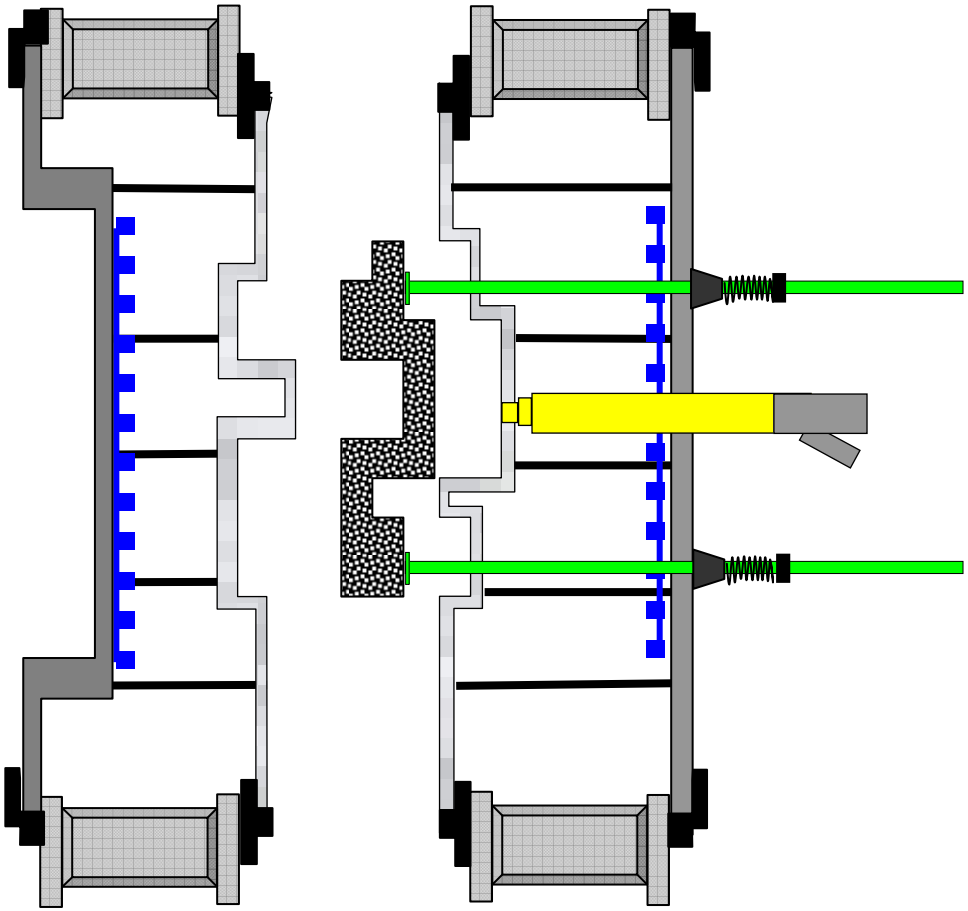
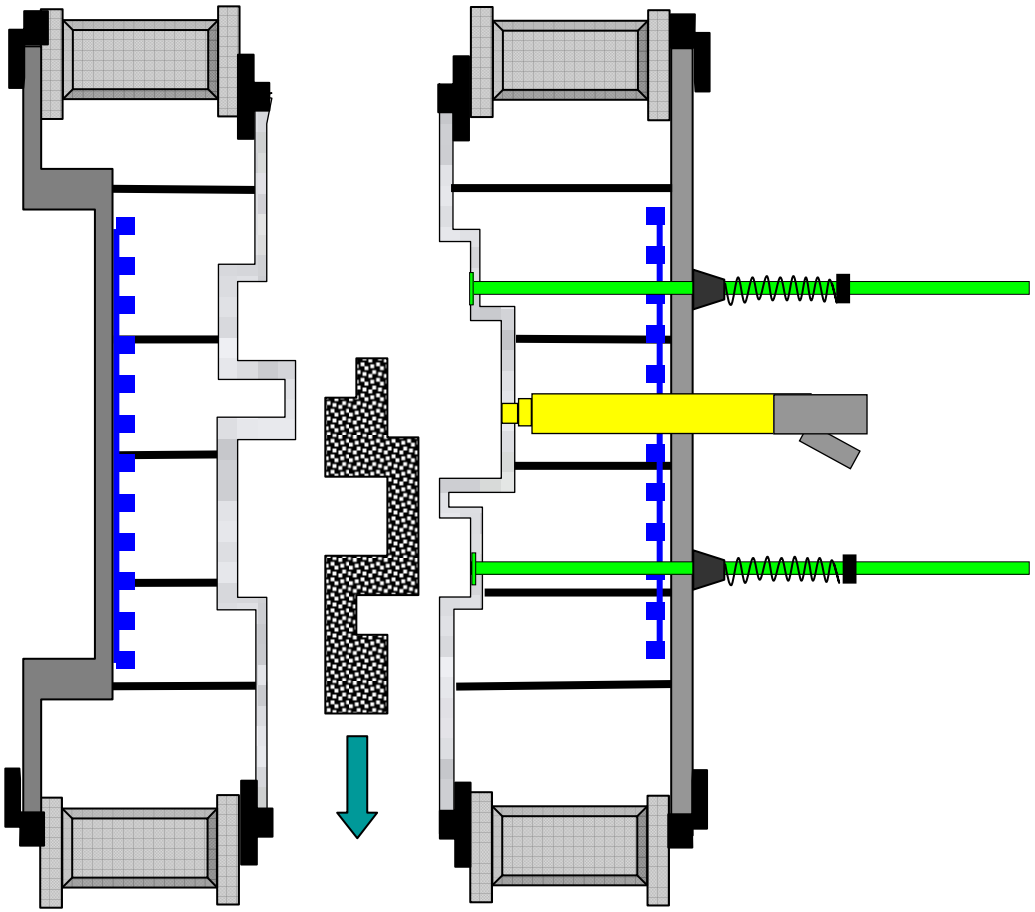
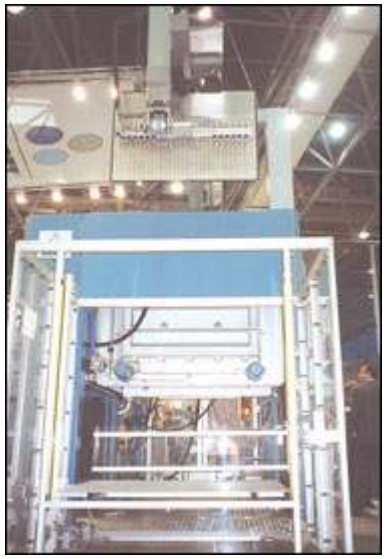


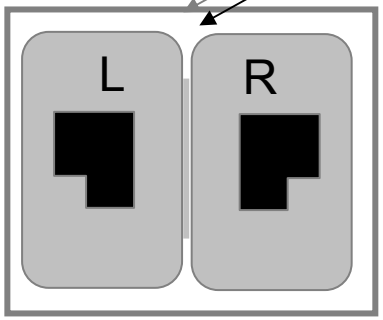




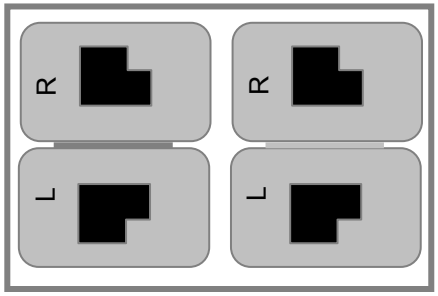
Molding



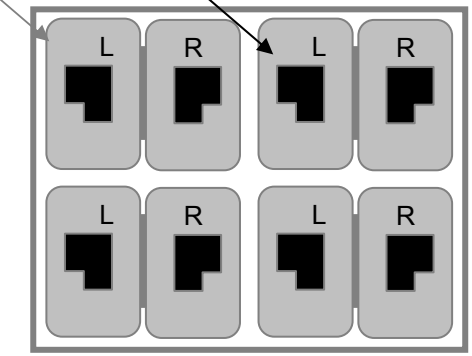
Possible Tool-Layouts



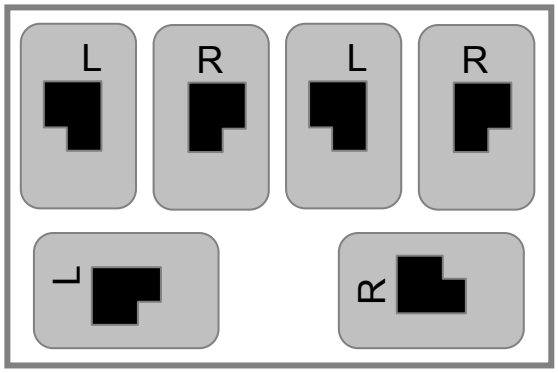
2 Cavities, 1 Set Tool



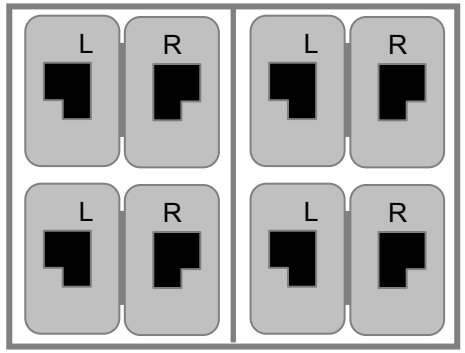
4 Cavities, 2 Set Tool



8 Cavities, 4 Set Tool



6 Cavities, Sets not connected by a break-line



8 Cavities, 4 Set Tool, separated in 2 x 2 Sets, which can be operated separately, interesting for tool-changes during product lifetime.