Molding & Liner 101

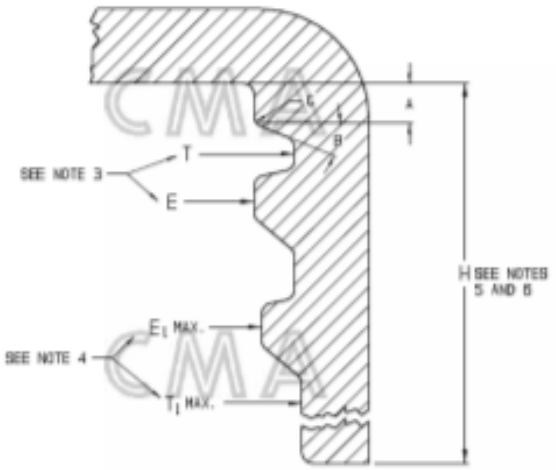
Choosing the Right Closure and Liner Combination for your Package

Packaging with purpose.

What value does the liner bring to your package?

- Leak prevention
- Ensure consumer confidence
- Tamper-evidence
- Shelf-life extension
- Safety and security
- Active ingredients remain active
- Seals in factory freshness
- Prevents product contamination
- Retains aroma/fragrance
- Prevents product pilferage

For Reference



CLOSURE FOR FINISH NO.	T.P.I.	T SEE NOTE 3 MAX.	T SEE NOTE 3 MIN.	T1 SEE NOTE 4 MAX.	E SEE NOTE 3 MAX.	E SEE NOTE 3 MIN.	E1 SEE NOTE 4 MAX.	H SEE NOTES 5&6 MAX.	H SEE NOTES 5&6 MIN.
18-400	8	.719	.705	.726	.685	.671	.642	.377	.359
20-400	8	.798	.784	.805	.764	.750	.721	.377	.359
22-400	8	.877	.863	.884	.793	.779	.800	.377	.359
24-400	8	.955	.941	.962	.871	.857	.878	.406	.388
28-400	6	1.103	1.089	1.110	1.009	.985	1.016	.406	.388
30-400	6	1.042	1.128	1.148	1.048	1.034	1.055	.406	.388
33-400	6	1.280	1.266	1.287	1.186	1.172	1.193	.406	.388
35-400	6	1.379	1.365	1.386	1.285	1.271	1.292	.406	.388
38-400	6	1.491	1.477	1.498	1.397	1.383	1.404	.406	.388
40-400	6	1.595	1.581	1.602	1.501	1.487	1.508	.406	.388
43-400	6	1.694	1.655	1.676	1.575	1.561	1.582	.406	.388
45-400	6	1.755	1.741	1.762	1.661	1.647	1.668	.406	.388
48-400	6	1.885	1.871	1.892	1.791	1.777	1.798	.406	.388
51-400	6	1.983	1.969	1.990	1.889	1.875	1.896	.406	.388
53-400	6	2.082	2.068	2.089	1.988	1.974	1.995	.406	.388
58-400	6	2.239	2.225	2.246	2.145	2.131	2.152	.406	.388
60-400	6	2.357	2.343	2.364	2.263	2.249	2.270	.406	.388
63-400	6	2.476	2.462	2.483	2.382	2.368	2.389	.406	.388
66-400	6	2.594	2.580	2.601	2.500	2.486	2.507	.406	.388
70-400	6	2.751	2.737	2.758	2.657	2.643	2.664	.406	.388
75-400	6	2.928	2.914	2.935	2.834	2.820	2.841	.406	.388
77-400	6	3.050	3.036	3.058	2.956	2.942	2.964	.485	.467
83-400	5	3.285	3.259	3.293	3.085	3.149	3.173	.485	.467
89-400	5	3.528	3.512	3.537	3.408	3.392	3.417	.539	.515
100-400	5	3.956	3.608	3.965	3.836	3.818	3.845	.585	.577
110-400	5	4.350	4.322	4.360	4.230	4.212	4.240	.585	.577
120-400	5	4.745	4.725	4.756	4.625	4.605	4.636	.669	.665

NOTES:

1. THE CLOSURE DIMENSIONS SHOWN ARE THOSE WHICH HAVE GENERALLY BEEN FOUND TO BE FUNCTIONAL BASED ON INDUSTRY EXPERIENCE. BECAUSE OF VARIABILITY IN PLASTIC CLOSURE MATERIALS AND CONTAINER FINISHES, HOWEVER, EACH CLOSURE/FINISH SYSTEM SHOULD BE INDIVIDUALLY EVALUATED TO ENSURE IT MEETS APPLICABLE PERFORMANCE CRITERIA. CLOSURES HAVING DIMENSIONS OUTSIDE THESE RANGES ARE ALSO APPROPRIATE FOR USE IF APPLICABLE PERFORMANCE CRITERIA ARE MET.
2. THE "T" AND "T1", "E" AND "E1" DIMENSIONS ARE THE AVERAGE OF TWO DIAMETERS MEASURED APPROXIMATELY 90° APART. THE LIMITS OF OVALITY WILL BE DETERMINED BY CLOSURE SUPPLIER AND CLOSURE CUSTOMER AS NECESSARY.
3. THE "T" AND "E" DIMENSIONS ARE TO BE MEASURED AT THE TOP OF THE CLOSURE AT A PRACTICAL POINT NEAR THE END OF FULL THREAD.
4. THE "T1" MAX. AND "E1" MAX. DIMENSIONS ARE TO BE MEASURED NEAR THE BOTTOM OF THE CLOSURE AT THE START OF FULL THREAD. THE VALUE FOR "T1" MAX AND "E1" MAX. INCLUDE A DRAFT ANGLE.
5. MAXIMUM CLOSURE "H" DIMENSION SHALL EQUAL THE MINIMUM "H" DIMENSION OF THE BOTTLE FINISH PLUS THE COMPRESSED LINER THICKNESS. MINIMUM CLOSURE "H" DIMENSION SHALL EQUAL THE MAXIMUM CLOSURE "H" DIMENSION MINUS THE TOTAL TOLERANCE RANGE.
6. THE CLOSURE "H" DIMENSIONS SPECIFIED ON THIS DRAWING ARE BASED ON GPI FINISH SPECIFICATIONS. FOR PLASTIC BOTTLE FINISHES, REVIEW SPECIFICATIONS TO DETERMINE IF PROPER CLEARANCE IS AVAILABLE. ALL CLOSURE/FINISH SYSTEMS SHOULD BE INDIVIDUALLY EVALUATED TO INSURE THAT APPLICABLE PERFORMANCE CRITERIA ARE MET.
7. IT IS IMPORTANT THAT THE LINER WELL DEPTH "A", THE SHOULDER ANGLE "B", AND THE FILLET RADIUS "C", BE ADJUSTED TO PROVIDE THE PROPER CLEARANCE WITH THE MINIMUM "S" DIMENSION OF THE BOTTLE FINISH.
8. THREAD CONTOUR AND OUTSIDE CLOSURE CONTOUR SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY.
9. FOR OPTIMUM SEALING RESULTS, A MINIMUM OF 360° THREAD ENGAGEMENT IS DESIREABLE.
0. MAINTENANCE OF PROPER THREAD DEPTH REQUIRES THAT VARIATIONS IN THE "E" DIMENSION SHOULD FOLLOW THOSE OF THE "T", SUBJECT TO NORMAL MANUFACTURING CONDITIONS.

PAUL MARSHALL — DRAFTSMAN

DARLA WILLIAMSON — REGULATORY

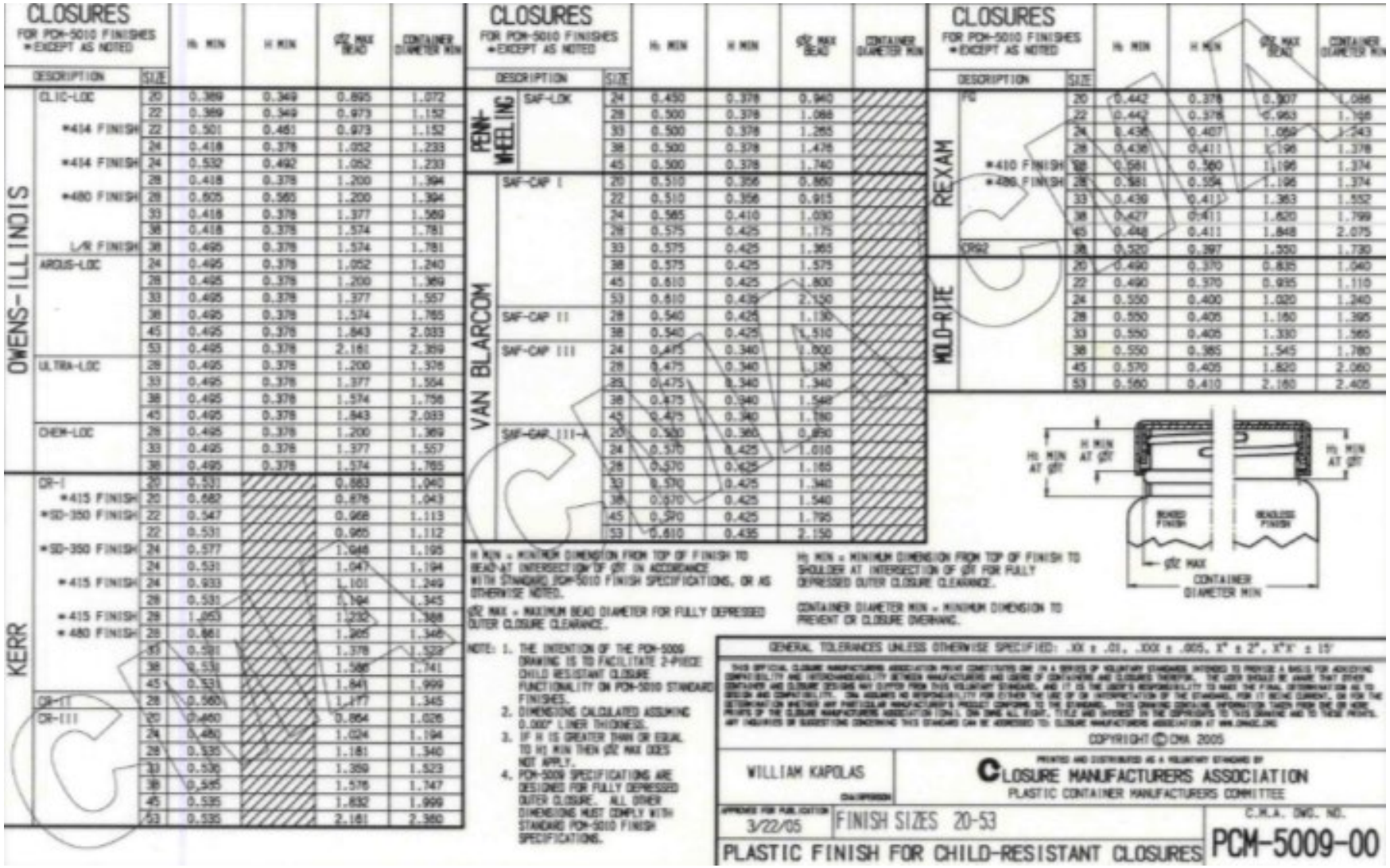
CLOSURE MANUFACTURERS ASSOCIATION

PLASTIC CLOSURE TECHNICAL COMMITTEE

APPROVED FOR PUBLICATION	SUPERSEDES DWG. NO.	CLOSURE DESIGN SERIES	C.M.A. DWG. NO.
03-15-00	PC-4002	P-400	PC-4003

CONTINUOUS THREAD PLASTIC CLOSURES FOR GLASS AND PLASTIC 400 FINISHES

For Reference



CLOSURES
FOR PCM-5010 FINISHES
*EXCEPT AS NOTED

	DESCRIPTION	SIZE	H1 MIN	H MIN	Ø2 MAX BEAD	CONTAINER DIAMETER MIN
OWENS-ILLINOIS	CLIC-LOC	20	0.389	0.349	0.895	1.072
		22	0.389	0.349	0.973	1.152
	*414 FINISH	22	0.501	0.461	0.973	1.152
		24	0.418	0.378	1.052	1.233
	*414 FINISH	24	0.532	0.492	1.052	1.233
		28	0.418	0.378	1.200	1.394
	*480 FINISH	28	0.505	0.565	1.200	1.394
		33	0.418	0.378	1.377	1.569
		38	0.418	0.378	1.574	1.781
	L/R FINISH	38	0.495	0.378	1.574	1.781
	ARGUS-LOC	24	0.495	0.378	1.052	1.240
		28	0.495	0.378	1.200	1.369
		33	0.495	0.378	1.377	1.557
		38	0.495	0.378	1.574	1.765
		45	0.495	0.378	1.843	2.033
		53	0.495	0.378	2.161	2.359
	ULTRA-LOC	28	0.495	0.378	1.200	1.376
		33	0.495	0.378	1.377	1.554
		38	0.495	0.378	1.574	1.758
		45	0.495	0.378	1.843	2.033
	CHEM-LOC	28	0.495	0.378	1.200	1.369
		33	0.495	0.378	1.377	1.557
		38	0.495	0.378	1.574	1.765
KERR	DR-I	20	0.531		0.883	1.040
	*415 FINISH	20	0.682		0.876	1.043
	*SD-350 FINISH	22	0.547		0.968	1.113
		22	0.531		0.965	1.112
	*SD-350 FINISH	24	0.577		1.046	1.195
		24	0.531		1.047	1.194
	*415 FINISH	24	0.933		1.101	1.249
		28	0.531		1.194	1.345
	*415 FINISH	28	1.053		1.232	1.388
	*480 FINISH	28	0.881		1.205	1.348
		33	0.531		1.378	1.529
		38	0.531		1.580	1.741
		45	0.531		1.841	1.999
	DR-II	28	0.560		1.177	1.345
	DR-III	20	0.660		0.864	1.026
		24	0.480		1.024	1.194
		28	0.535		1.181	1.340
		33	0.530		1.359	1.523
		38	0.535		1.576	1.747
		45	0.535		1.832	1.999
		53	0.535		2.161	2.360

CLOSURES
FOR PCM-5010 FINISHES
*EXCEPT AS NOTED

	DESCRIPTION	SIZE	H1 MIN	H MIN	Ø2 MAX BEAD	CONTAINER DIAMETER MIN
PENN-WHEELING	SAF-LOK	24	0.450	0.378	0.940	
		28	0.500	0.378	1.088	
		33	0.500	0.378	1.265	
		38	0.500	0.378	1.476	
		45	0.500	0.378	1.740	
VAN BLARCOM	SAF-CAP I	20	0.510	0.356	0.860	
		22	0.510	0.356	0.915	
		24	0.565	0.410	1.030	
		28	0.575	0.425	1.175	
		33	0.575	0.425	1.365	
		38	0.575	0.425	1.575	
		45	0.610	0.425	1.800	
		53	0.610	0.435	2.150	
	SAF-CAP II	28	0.540	0.425	1.130	
		38	0.540	0.425	1.510	
	SAF-CAP III	24	0.475	0.340	1.000	
		28	0.475	0.340	1.180	
		33	0.475	0.340	1.340	
		38	0.475	0.340	1.540	
		45	0.475	0.340	1.780	
	SAF-CAP III-A	20	0.560	0.360	0.890	
		24	0.570	0.425	1.010	
		28	0.570	0.425	1.165	
		33	0.570	0.425	1.340	
		38	0.570	0.425	1.540	
		45	0.570	0.425	1.795	
		53	0.610	0.435	2.150	

CLOSURES
FOR PCM-5010 FINISHES
*EXCEPT AS NOTED

	DESCRIPTION	SIZE	H1 MIN	H MIN	Ø2 MAX BEAD	CONTAINER DIAMETER MIN
REXAM	PT	20	0.442	0.378	0.907	1.086
		22	0.442	0.378	0.963	1.166
		24	0.436	0.407	1.059	1.243
		28	0.436	0.411	1.196	1.378
	*410 FINISH	38	0.581	0.560	1.196	1.374
	*486 FINISH	28	0.581	0.554	1.196	1.374
		33	0.439	0.411	1.363	1.552
		38	0.627	0.411	1.620	1.799
		45	0.448	0.411	1.848	2.075
	ORS2	38	0.520	0.397	1.350	1.730
MOLD-RITE		20	0.490	0.370	0.835	1.040
		22	0.490	0.370	0.935	1.110
		24	0.550	0.400	1.020	1.240
		28	0.550	0.405	1.160	1.395
		33	0.550	0.405	1.330	1.565
		38	0.550	0.385	1.545	1.780
		45	0.570	0.405	1.820	2.060
		53	0.560	0.410	2.160	2.405

H MIN = MINIMUM DIMENSION FROM TOP OF FINISH TO BEAD AT INTERSECTION OF Ø2 IN ACCORDANCE WITH STANDARD PCM-5010 FINISH SPECIFICATIONS, OR AS OTHERWISE NOTED.

Ø2 MAX = MAXIMUM BEAD DIAMETER FOR FULLY DEPRESSED OUTER CLOSURE CLEARANCE.

H1 MIN = MINIMUM DIMENSION FROM TOP OF FINISH TO SHOULDER AT INTERSECTION OF Ø2 FOR FULLY DEPRESSED OUTER CLOSURE CLEARANCE.

CONTAINER DIAMETER MIN = MINIMUM DIMENSION TO PREVENT OR CLOSURE OVERHANG.

NOTE:
1. THE INTENTION OF THE PCM-5009 DRAWING IS TO FACILITATE 2-PIECE CHILD RESISTANT CLOSURE FUNCTIONALITY ON PCM-5010 STANDARD FINISHES.
2. DIMENSIONS CALCULATED ASSUMING 0.000" LINER THICKNESS.
3. IF H IS GREATER THAN OR EQUAL TO H1 MIN THEN Ø2 MAX DOES NOT APPLY.
4. PCM-5009 SPECIFICATIONS ARE DESIGNED FOR FULLY DEPRESSED OUTER CLOSURE. ALL OTHER DIMENSIONS MUST COMPLY WITH STANDARD PCM-5010 FINISH SPECIFICATIONS.

GENERAL TOLERANCES UNLESS OTHERWISE SPECIFIED: .XX ± .01, .XXX ± .005, X° ± 2°, X°F ± 15'

WILLIAM KAPOLAS

CLOSURE MANUFACTURERS ASSOCIATION
PLASTIC CONTAINER MANUFACTURERS COMMITTEE

3/22/05

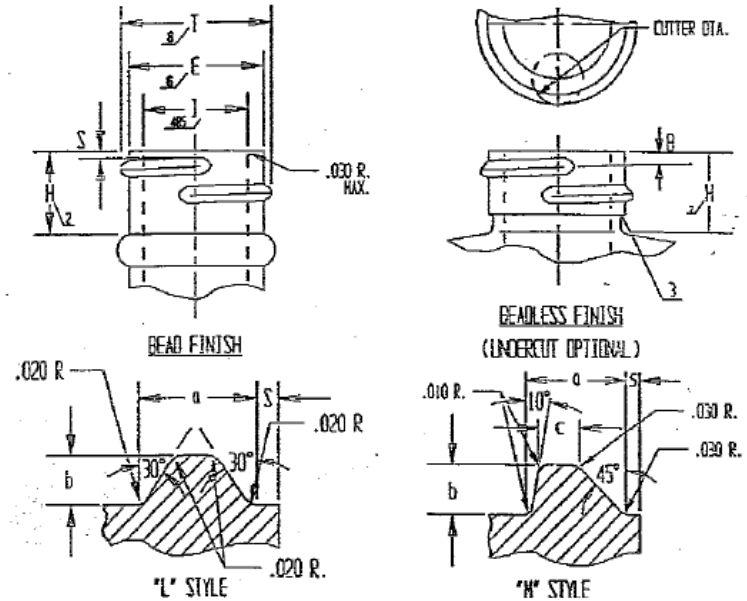
FINISH SIZES 20-53

C.M.A. DWG. NO. PCM-5009-00

PLASTIC FINISH FOR CHILD-RESISTANT CLOSURES

Packaging with purpose.

For Reference



ALL PURPOSE THREAD (PLASTIC OR METAL CAP)		
THDS/IN	a	b
5	.120	.060
6	.094	.047
8	.084	.042

MODIFIED BUTTRESS THD (PLASTIC CAPS)			
THDS/IN	a	b	c
5	.120	.060	.049
6	.094	.047	.039
8	.084	.042	.035

THREAD CROSS SECTIONS

Example Thread Nomenclature

"L" Style: L28SP400 or "M" Style: M28SP400

NOTE:

1. A MINIMUM OF ONE full turn of thread shall be maintained.
2. Dimension H is measured from the top of the finish to the point where diameter I, extended parallel to the centerline, intersects the bead or shoulder.
3. Contour of bead, undercut or shoulder is optional.
4. unless otherwise specified, I min. applies to the full length of the opening.
5. Concentricity of I min. with respect to diameters T and E is not included I min. is specified for filler tube only.
6. T and E dimensions are the average of two measurements taken 90 apart. The limits of ovality will be determined by the container supplier and container customer, as necessary.
7. All dimensions are in inches unless otherwise indicated.

* To the best of our knowledge the information contained herein is accurate.

SP-400 FINISH
FOR PLASTIC BOTTLES

MM	T 5/		E 6/		H 2/		S		I 105/	HELIX ANGLE	CUTTER DIA.	THD PER INCH
	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MIN.	R		
18	.740	.688	.620	.604	.365	.356	.052	.022	.325	3°30'	.375	8
20	.783	.767	.699	.683	.365	.356	.052	.022	.404	3°7'	.375	8
22	.862	.846	.778	.762	.365	.356	.052	.022	.483	2°49'	.375	8
24	.940	.924	.856	.840	.415	.385	.061	.031	.516	2°34'	.375	8
28	1.088	1.068	.994	.974	.415	.385	.061	.031	.614	2°57'	.500	6
30	1.127	1.107	1.033	1.013	.418	.388	.061	.031	.653	2°51'	.500	6
33	1.265	1.241	1.171	1.147	.418	.388	.061	.031	.791	2°31'	.500	6
35	1.364	1.340	1.270	1.246	.418	.388	.061	.031	.875	2°21'	.500	6
38	1.476	1.452	1.382	1.358	.418	.388	.061	.031	.987	2°9'	.500	6
40	1.580	1.550	1.486	1.456	.418	.388	.061	.031	1.091	2°0'	.500	6
43	1.654	1.624	1.560	1.530	.418	.388	.061	.031	1.165	1°55'	.500	6
45	1.740	1.710	1.646	1.616	.418	.388	.061	.031	1.251	1°49'	.500	6
48	1.870	1.840	1.776	1.746	.418	.388	.061	.031	1.381	1°41'	.500	6
51	1.968	1.933	1.874	1.839	.423	.393	.061	.031	1.479	1°36'	.500	6
53	2.067	2.032	1.973	1.938	.423	.393	.061	.031	1.578	1°31'	.500	6
58	2.224	2.189	2.130	2.095	.423	.393	.061	.031	1.735	1°25'	.500	6
60	2.342	2.307	2.248	2.213	.423	.393	.061	.031	1.853	1°20'	.500	6
63	2.461	2.426	2.367	2.332	.423	.393	.061	.031	1.972	1°16'	.500	6
66	2.579	2.544	2.485	2.450	.423	.393	.061	.031	2.090	1°13'	.500	6
70	2.736	2.701	2.642	2.607	.423	.393	.061	.031	2.247	1°8'	.500	6
75	2.913	2.819	2.819	2.784	.423	.393	.061	.031	2.424	1°4'	.500	6
77	3.035	3.000	2.941	2.906	.502	.472	.075	.045	2.546	1°1'	.500	6
83	3.268	3.233	3.148	3.113	.502	.472	.075	.045	2.753	1°9'	.500	5
89	3.511	3.476	3.391	3.356	.559	.520	.075	.045	2.918	1°4'	.500	5
100	3.937	3.902	3.817	3.782	.612	.582	.075	.045	3.344	0°57'	.500	5
110	4.331	4.296	4.211	4.176	.612	.582	.075	.045	3.737	0°51'	.500	5
120	4.724	4.689	4.604	4.569	.709	.670	.075	.045	4.131	0°47'	.500	5

PLASTIC BOTTLE DIVISION S.P.I.

TECHNICAL COMMITTEE

FIG. No.1

DRAWING NUMBER	RE
SP-400	1

Packaging with purpose.

Types of Liners:
Non-induction

Function:

- Sealing, shelf life and reseal

Foam:

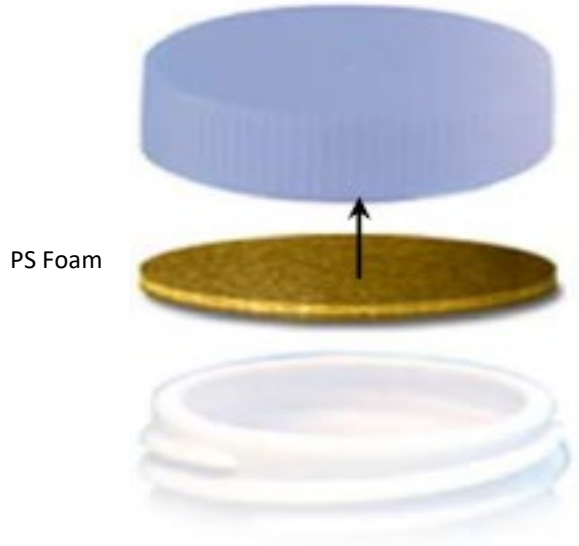
- Co-extruded multi layer PE, PP and resin blends
- Co-extruded and single extrusion PE and PP with facing and/or foil laminations

Facings:

- Backings: pulp or foam
- Facings: PE, Saran™, PET, foil laminations with multi-layer substrates

Types of Liners:
Non-induction “Tac Seals” & Glue Applied Liner

- **Pressure Sensitive Foam:**
  - Polystyrene foam, encapsulated adhesive: activated by torque
  - Vitamins and nutritional supplements
  - Does not comply with FDA Tamper Evident Regulations



Types of Liners:
Induction FoilSeal™

One Piece Foil Seal

Two Piece Foil Seal

Two Piece Foil Seal
(Improved Reseal Barrier)

Types of Liners:
Induction Tabbed Versions

Lift N Peel

One Piece Foil Seal

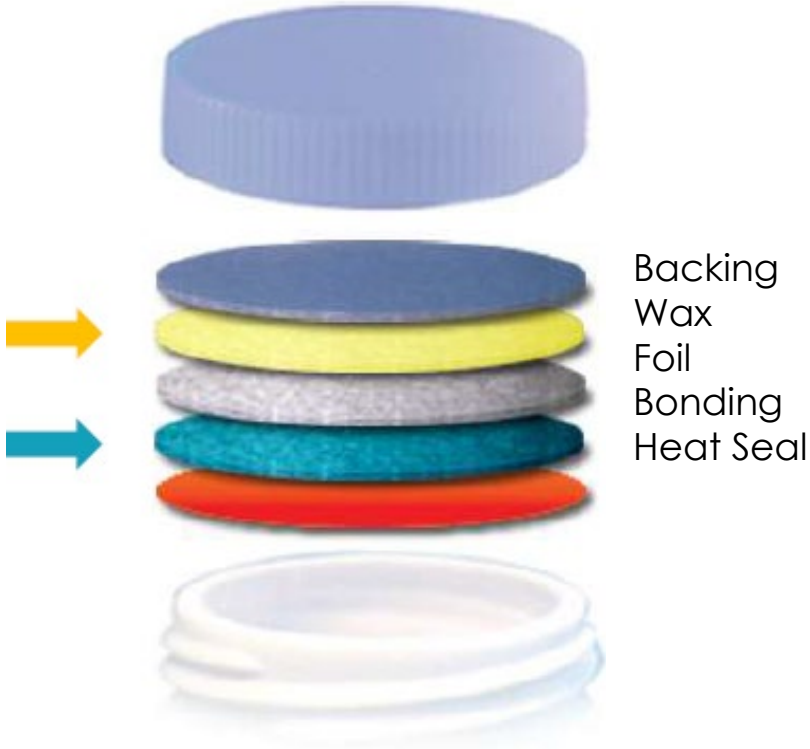
Top Tab

Two Piece Foil Seal

Types of Liners:
FoilSeal™ Bonding Layers

- **Two Piece Liners**
  - Temporary Bond
  - Paraffin Wax –
    softens @ 125o F
    absorbs into pulp at 150o F

- **One Piece Liners**
  - Laminated (standard)
  - Water or solvent based
  - Extruded resin (more robust bond)



Laminations:

Why do liners cost so much?

- Pass 1 =
  Foil
  + Adhesive/Bonding
  + PET
- Pass 2 = Pass + HS
- Pass 3 = Pass 1 + 2 + 3
- Pass 4 = Slit into rolls

How does liner cost affect the total cost?

- In and 53mm cap and above the liner cost is typically more than the closure
- Double lined closures could both increase cost or reduce cost
- Removing layers in the structure will reduce cost
- Changing the backing material will affect cost

Removal Characteristics

Clean Peel

Remove entire liner in one piece with minimal / no residue

Tamper-Evident

FDA's definition: Visible indicator that tampering has occurred

Welded Seal

Removal Characteristics

Lift ‘n’ Peel™ H

Lift the Tab

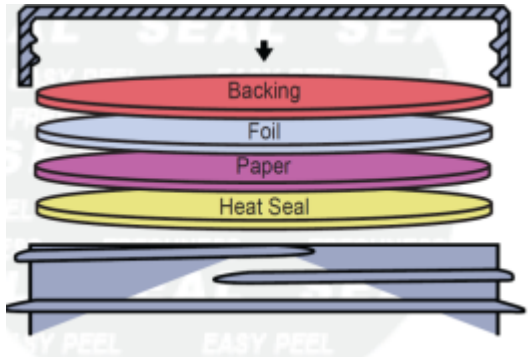
Pull the Tab

Paper Layer Exposed

Easy Entry Puncture

Venting Solutions

- Paper down heat seals, will provide out gassing and in gassing through the paper membrane
- They are to be
  used on dry products only



Spec Review

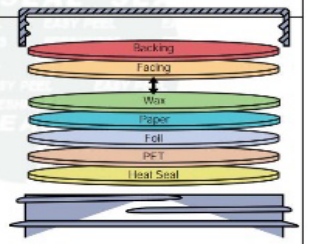
Selig

FoilSeal™
Data Sheet
.030" Pulp FSLE 1-15

Revision: FS115-01152007

Product	.030" Pulp FSLE 1-15
Scope	Two piece pulp backed reseal base liner heat induction foil innerseal that provides an aggressive bond with clean peel removal from PE and PP containers with added barrier layer for sealing agressive products.
Composition	

Material	Standard	Metric
Backing	.030"	.762 mm
Facing	.003"	.0762mm
Wax	-	-
Paper	.006"	.1524mm
Foil	.001"	.0254mm
PET	.0005"	.0127mm
Heat Seal	.002"	.0508mm



Composition does not include adhesive, resin or wax bonding layers (if any).

FDA Status:	21 CFR 177.1210	**Recommended Storage and Handling:**			
Drug Master File (DFM):	#4544	**Canadian DMF:**		**EU / EP Reg.:**	
GTR Oxygen:	Essentially Zero	**MVTR:**	Essentially Zero		
Print Location (if any):	Foil Layer and/or Heat Seal Layer				

Selig materials are compliant with current USFDA Food allergen Guidelines.
Selig materials are compliant with California Proposition 65 labeling requirements.
Selig materials are compliant with limitation of heavy metals in packaging per CONEG & EU 94/62/EC, article 11.

MSDS's are not required as Selig is not a chemical manufacturer or distributor and our products are 'articles' intended for food packaging per 29 CFR 1910.1200 (HazCom).

The information contained within this product data bulletin is to be used as a general guide in determining which structures are offered for sealing to specific container materials. All of the information which we provide is reliable to the best of our knowledge, but the accuracy thereof is not guaranteed. We suggest that consumers determine suitability for their own application.

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All Selig manufacturing facilities are ISO 9001 certified. For details, visit www.seligsealing.com/certifications

When is a liner equivalent?

Selig liners

Safe-Gard™ Type A Technical Data Sheet

.020" Pulp SG-75M

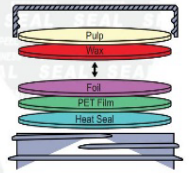
Revision: SG75M-03142016

MRP DESCRIPTION - (075)SG75M.020 W SFYP

Product	.020" Pulp SG-75M
Scope	Two piece white-lined pulp backed heat induction foil innerseal that will provide a tamper evident seal to PE containers.

Composition

Material	Standard	Metric
Pulp	0.020"	0.508mm
Wax	-	-
Foil	0.001"	0.025mm
PET Film	0.0005"	0.013mm
Heat Seal	0.0015"	0.038mm



FDA Status: 21 CFR 177.1210	**Recommended Storage and Handling:** Refer to website
Drug Master File (DMF): 3782	**EU / EP Reg.:**
GTR Oxygen: Essentially Zero	**MVTR:** Essentially Zero

Sealing to glass containers: Selig can not guarantee the performance or seal integrity of this materials when applied to any glass (treated or untreated) container. We suggest you contact your glass supplier for recommendations on glass treatments that may or may not improve performance or seal integrity.

Print Location (if any): On foil layer

Selig materials are compliant with limitation of heavy metals in packaging per CONEG & EU 94/62/EC, article 11.

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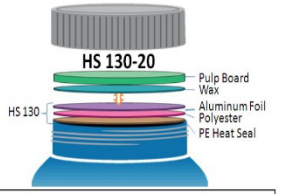
TRI-SEAL PRODUCT DATA SHEET

TEKNIPLEX

MRP Description - (130)HS130.020 B SFYP

- This data sheet describes HS 130-20 product
- Designed to provide a "tamper evident bond" to Polyethylene (PE) containers with an induction heat sealing device
- Composed of two pieces: an *innerseal (HS 130)* providing a sealable bond to a container and a *pulp board liner* that is separated from the innerseal to serve for reseal
- Available with custom or standard printing



Typical Product Attributes

Construction

Structure HS 130 ↔ Wax / Pulp Board	76,2µm ↔ 12,7µm / 508,0µm	0.003" ↔ 0.0005" / 0.020"
Minimum Width	25,4 mm	1.0 inch
Width Tolerance	± 1,6 mm	± 1/16 inch

Properties

Water Vapor Transmission (WVTR)	Essentially Zero
Gas (O_2, CO_2, & Others) Transmission (GTR)	Essentially Zero

Regulatory Compliance

FDA Compliance	21 CFR 177.1520 (Olefin Polymers) 21 CFR 177.1630 (Polyethylene Phthalate Polymers) 21 CFR 177.1210 (Closures with Sealing Gaskets for Food Containers) 21 CFR 175.300 (Resinous and Polymeric Coatings) 21 CFR 178.3710 (Petroleum wax) 21 CFR 175.105 (Adhesives) 21 CFR 175.125 (Pressure - sensitive adhesives) 21 CFR 186.1673 (Pulp) 21 CFR 176.260 (Pulp from reclaimed fiber) 21 CFR 176.170: (Components of paper and paperboard in contact with aqueous and fatty foods)
Drug Master File (DMF)	1378
Other Compliances	USFDA Food Allergen Guidelines; California Proposition 65 labeling requirements; Limitations of heavy metals in packaging per CONEG & EU 94/62/EC, article 11

Original Date: 04/15/2011
Revised Date: 01/12/2011
Revision Number: 1
Revised by: SR

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Liner Product Data Sheet

Title: (A01)MRPLN04.020 FOAM R SFYP

Description of Product: Universal Heat Seal Foam Liner

Detailed Product Description: This product is a one piece universal heat seal consisting of foam backing, paper, aluminum foil and heat seal layer.

- Polystyrene Foam
- Paper
- Aluminum Foil
- Heat Seal Coating

Regulatory Compliance:
21 CFR 177.1210 Closures with sealing gaskets for food containers.

Typical Properties: This specification, designated by Mold-Rite Plastics, includes all liners that meet the typical value data listed below:

Typical Properties	Typical Value
Overall Thickness	0.024 inch +/- 10%
• Polystyrene Foam	• .0200 inch
• Paper	• .0025 inch
• Aluminum Foil	• .0003 inch
• Heat Seal Coating	• .0015 inch
Drug Master File	16574
Printed	"SEALED FOR YOUR PROTECTION"
Print Color	Red
Oxygen Transmission	Essentially Zero
Water Vapor Transmission	Essentially Zero

Disclaimers:
1. These are typical properties.
2. All data values and regulatory requirements were obtained from manufacturer product data sheets (where applicable).
3. Product data sheets data are intended as a general guide only and do not necessarily represent results that may be obtained elsewhere.
4. Use of Mold-Rite Plastics products must be guided by users' methods for selection of proper formulation.
5. Mold-Rite Plastics disclaims any responsibility for misuse or misapplication of its products.
6. Mold-Rite Plastics liability and customer's exclusive remedy for any claims arising out of sales of its products are expressly limited at: customer option for replacement not to exceed the purchase price plus transportation charges thereon.

Rev. 071818

Selig
Freshness and Protection for Today's Packaging

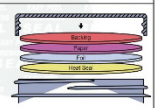
FoilSeal™ Data Sheet

.020" PS Foam FS5-8

Revision: FS58-01182014

MRP Description - (58F)FS5-8.020 R SFYP FOAM

Product	.020" PS Foam FS5-8		
Scope	One piece foam backed heat induction foil inner seal which will provide a tamper-evident bond to polyethylene, polystyrene, PET, PVC, polypropylene and treated glass containers. It is recommended for liquid products and is an alternative to FS 5-4.		
Composition	**Material**	**Standard**	**Metric**
	Backing	.020"	.508 mm
	Paper	.002"	.0508mm
	Foil	.0003"	.0076mm
	Heat Seal	.0015"	.0381mm



Composition does not include adhesive, resin or wax bonding layers (if any)

FDA Status:	21 CFR 177.1210	**Recommended Storage and Handling:**	
Drug Master File (DFM):	#4544	**Canadian DMF:**	**EU / EP Reg.:**
GTR Oxygen:	Essentially Zero	**MVTR:** Essentially Zero	**Print Locatoin (if any):** Heat Seal Layer and/or Backing

Sealing to glass containers: Selig can not guarantee the performance or seal integrity of this materials when applied to any glass (treated or untreated) container. We suggest you contact your glass supplier for recommendations on glass treatments that may or may not improve performance or seal integrity.

Selig materials are compliant with current USFDA Food allergen Guidelines.
Selig materials are compliant with California Proposition 65 labeling requirements.
Selig materials are compliant with limitation of heavy metals in packaging per CONEG & EU 94/62/EC, article 11.

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SANCAP
Liner Technology, Incorporated

PRODUCT DATA SHEET
HS035 N/20 LD Foam

MRP Description - (21N)HS035N/20LD.020 FOAM R SFYP

PRODUCT DESCRIPTION

Description: A paper-backed aluminum foil coated with a clear heat sealable coating blend of high molecular weight ethylene and vinyl acetate copolymers on the foil, laminated to low dense polystyrene foam.

FDA Status: Complies with Federal Regulations of H.E.W.,FDA,Sections 175.105,175.300, 176.170,176.180, 177.1350,177.1640, 178.3010,178.3710, and 182.1.

PHYSICAL AND CHEMICAL PROPERTIES

1. Color	Aluminum
2. Thickness, mils	
(a) Overall	21.51 - 27.38
(b) Heat Seal	1.50 - 3.0
(c) Aluminum	0.31 - 0.38
(d) Paper (NK)	1.70 - 2.00
(e) Polystyrene Foam	18.00 - 22.00
3. Basis Wt. Lbs./Ream 3000 ft²	
(a) Overall	102.15 - 151.80
(b) Heat Seal	20.7 - 41.9
(c) Aluminum	13.3 - 18.2
(d) Paper (NK)	28.50 - 31.50
(e)Polystyrene Foam	39.65 - 62.20
4. Heat Seal Coating	
(a) Melting Point I.F	150 - 160
(b) Blocking Point I.F	130 - 135
5. Gas Transmission: cc/cin²/24hrs/1atm	
(a) Oxygen	near zero
6. Water Vapor Transmission	
a) gm/cin² /24 hrs/100°F/90% RH	near zero

RECOMMENDED STORAGE CONDITIONS

The material should be stored in well-ventilated area (temp. 60° - 80°F., RH - 40% - 60%). Material and lined closures are heat sensitive. Storage or shipping temperatures should not be in excess of 105°F. Curling, blocking, splitting or foil separation may result. If material becomes chilled, it should be stored under the recommended conditions until stabilized. Avoid storing closure liner materials over 60 days. Metal foil is prone to corrosion.

SUGGESTED PRODUCT USES

Material is a heat sealable tamper indicating innerseal which can be used for over-the-counter drug products on Polyethylene, Glass, PET, PVC, Polystyrene and Polypropylene.

Dry Products

Product applications listed above are a partial listing and do not cover all suitable applications. These are recommendations for general categories and user must test for suitability for his specific product. Not suitable for products containing oil.

The technical information and suggestions for use made herein are based on SANCAP research and experience and are believed to be reliable, but such information and suggestions do not constitute a warranty, and no patent liability can be assumed. Since SANCAP has no control over the conditions under which the product is transported, stored, handled, used or applied, buyer must determine for himself, by preliminary tests or otherwise, the suitability of the product for his purposes. All products are sold subject to SANCAP-S written warranty, which is in lieu of all other warranties or merchantability and fitness for a particular purpose. SANCAP-S liability on any basis is limited to the price of the product used.

file:HS035 NK/20 LDF
2/20/2014

16125 Armour St. N.E. • Alliance, Ohio 44601 • 330-821-1166
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www.sancapliner.com

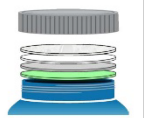
TRI SEAL PRODUCT DATA SHEET TEKNIPLEX

HS 035 HEAT SEAL/20F

MRP Description - (021)HS035.020 R SFYP

- Designed as a one-piece, polystyrene backed, induction heat seal with an ethylene vinyl acetate based sealant layer that gives a tamper evident bond to Polyethylene (PE), Polypropylene (PP), Polyester (PET), Polystyrene (PS), Vinyl (PVC) and glass containers.
- Available with standard or custom print.

Typical Product Attributes

Construction		SI (µm)	US (Mils)
Polystyrene Foam		508.0	20.0
Paper		71.1	2.8
Aluminum Foil		8.9	0.35
Heat Seal		63.5	2.25
Minimum Width		25.4 mm	1.0 inch
Width Tolerance		± 1.6 mm	± 1/16

Properties	
Water Vapor Transmission (MVTR)	Essentially Zero
Gas (O_2) (GTR)	Essentially Zero

Regulatory Compliance	
FDA Compliance	21 CFR 177.1640 Polystyrene and rubber-modified polystyrene.
	21 CFR 177.1350 Ethylene-vinyl acetate copolymers.
	21 CFR 177.1210 Closures with sealing gaskets for food containers.
	21 CFR 176.180 Components of paper and paperboard in contact with dry foods.
	21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods.
Drug Master File (DMF)	7518
Other Compliances	USFDA Food Allergen Guidelines; California Proposition 65 Labeling Requirements; Limitations of Heavy Metals in Packaging per CONEG & EU 94/62/EC, Article 11

Created Date: 2016-03-25
Revised Date: N/A
Revision Number: 0
Created by: PEY

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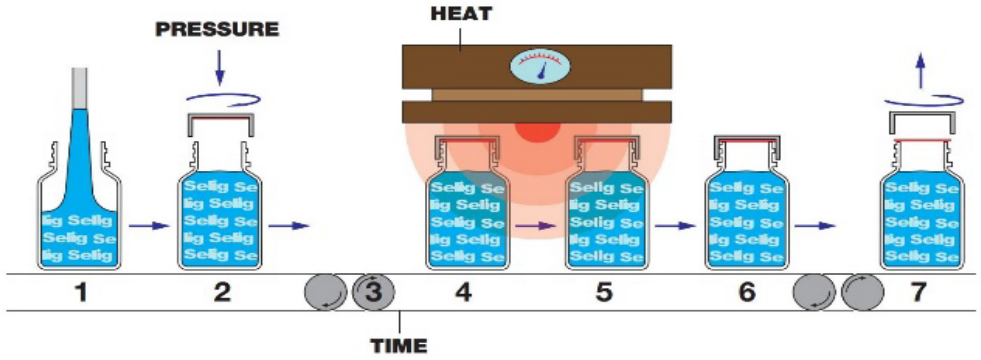
INDUCTION SEALING

What is Induction Sealing and how does it work?

Induction Sealing, otherwise known as cap sealing, is a non contact method of hermetically sealing a highly technical engineered laminated structure to the top of plastic and glass containers. The sealing process takes place after the container has been filled and capped. Induction sealing provides tamper evidence, leak prevention, freshness preservation, pilferage protection and enhances the brand of the sealed product.

This advanced technical manual will help you understand what the induction process is and what happens when an induction liner is sealed to the land area of the container. By understanding how to address and control induction sealing variables, you can achieve a perfect seal every time.

The process of developing a perfect seal depends upon several key operating factors to ensure that the maximum performance (operating window) is achieved. These factors include matching the closure to the container's neck profile to maintain PRESSURE; setting up the induction sealer to the correct performance HEAT levels; a correctly specified induction process places no limitation on your filling line speed TIME.



The Induction Process Stages

1. Filling
2. Capping with correct on-torque (pressure)
3. Product transported on conveyor (time)
4. } Induction period (heat)
5. }
6. Cooling
7. Sealed Container

HEAT SINK

The container acts as a heat sink. This means that when you induction seal the liner with sufficient pressure to the land area, the container ABSORBS heat from the induction seal liner.

Insufficient liner pressure and/or uneven pressure on the land area will result in poor seals. If the liner is not held evenly around the entire circumference of the container, the area that is not firmly in contact will overheat. Due to the overheating of the liner, the land area could suffer excessive meltdown, which in turn causes more uneven pressure. For example, if the induction seal liner, by itself, has been passed through the induction coil, it could reach a temperature of 600°F/ 315°C or more thus causing the liner to melt or possibly burn. This heat sink phenomenon is also influenced by the fill level and fill temperature. Normally a higher power setting is required for a cold fill than a hot fill. The same is true if the container is full rather than empty. If you have overhang of the liner or tabs are folded down the side of the container, this may cause problems with induction sealing. The induction field does not react to aluminum foil that is in a vertical position when passing under the induction head. In some cases with the tabs folded down, the induction field gets deflected so the liner in that area sees less heat. Round corners on the tab tend to deflect the induction field less than square corners on tabs.

If you have a large portion of the liner folded over the edge of the container, this can have a cooling effect on the part of the liner that is on the land area and may produce weak seals or leakers.

There are many factors to take into account and the following chapters will help you to address them.

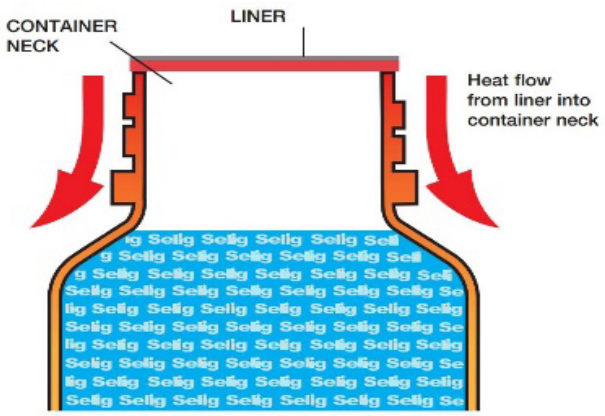
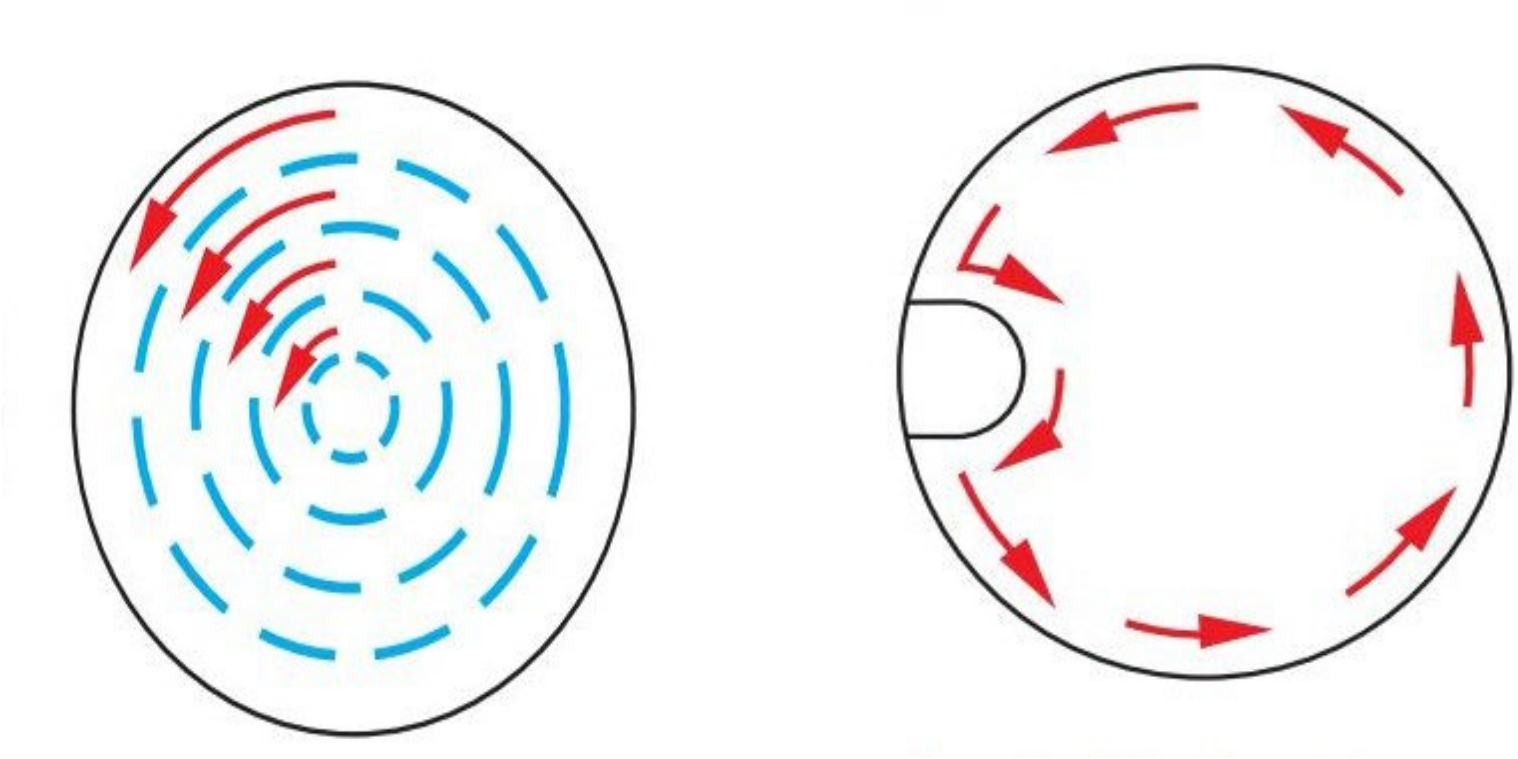


Figure 4f: Heating of the container during the induction process

How does the energy flow during induction?



Making the Right Liner Choice:
Closure Size

- 18mm-28mm
- 30mm-43mm
- 45mm-58mm
- 63mm-75mm (one piece heat seals unless 100% tested)
- 77mm-89mm (one piece heat seals unless 100% tested)
- 100mm-120mm (one piece heat seals unless 100% tested)

Making the Right Liner Choice:
Container Material Type

- PE
- PP
- PET
- CPET
- PVC
- PS
- Barex
- Glass
- PLA

Chemical Compatibility

Plastic Resin Codes

Abbreviation	Chemical Designation	Temp °C (Max)	Temp °C (Min)	Autoclavable	Microwavable	Dry Heat	Gas	Gamma	Disinfectants
ABS	Acryl-Butadienestyrene	100	-40	NO	YES	NO	YES	YES	YES
	Acetal (**Delrin®, Celcon®**)	100	-40	NO	YES	NO	YES	YES	YES
LDPE	Low Density Polyethylene	100	-80	NO	YES	NO	YES	YES	YES
HDPE	High Density Polyethylene	120	-100	NO	YES	NO	YES	YES	YES
NYL	Polyamide (**Nylon®**)	90	0	NO	YES	NO	YES	YES	YES
PCTFE	Polychlorotrifluoroethylene (**Kel-F®**)	80	0	NO	YES	NO	YES	YES	YES
PC	Polycarbonate	135	0	YES	YES	NO	YES	YES	YES
PP	Polypropylene	135	0	YES	YES	NO	YES	NO	YES
PTFE	Polytetrafluoroethylene (**Teflon®**)	250	-267	YES	YES	YES	YES	YES	YES
PVC	Polyvinyl Chloride	70	-30	NO	YES	NO	YES	NO	YES
PVDF	Kynar (polyvinyldene fluoride)	110	-62	YES	YES	NO	YES	NO	YES
E-CTFE	Ethylene Chlortrifluoroethylene	150	-105	YES	YES	YES	YES	NO	YES
ETFE	EthyleneTetrafluoroethylene (**Tefzel®**)	150	-105	YES	YES	YES	YES	NO	YES
PFA	Perfluoroalkoxy (**Teflon®**)	260	-270	YES	YES	YES	YES	NO	YES
San	Styrene	95	-20	NO	YES	NO	YES	YES	YES
PMP	Polymethylpentene (TPX)	175	-70	YES	YES	NO	YES	YES	YES
PMMA	Polymethylmetyacrylate (PMMP)	50	0	NO	YES	NO	YES	YES	YES
PS	Polystyrene	90	-20	NO	YES	NO	YES	YES	YES
PEEK	Polyetheretherketone	125	0	YES	YES	NO	YES	YES	YES
TFE	Tetrafluoroethylene (**Teflon®**)	260	-267	YES	YES	YES	YES	YES	YES

A = NO EFFECT, EXCELLENT
B = MINOR EFFECT, GOOD
C = MODERATE EFFECT, FAIR
D = SEVERE EFFECT, NOT RECOMMENDED

PLASTIC RESIN MATERIAL

SOLVENT	ABS	Acetal	E-CTFE	ETFE	HDPE	LDPE	NYL	PC	PCTFE	PEEK	PMP (TPX)	PP	PTFE	PVC	PMMP	PS	SAN	TFE
Acetaldehyde	D	A	A	A	B	C	C	C	A	A	C	C	A	D	D	D	D	A
Acetic Anhydride	C	D	A	A	D	D	C	D	A	A	B	B	A	D	D	D	D	A
Acetone	D	D	A	B	C	C	B	D	A	A	A	A	A	D		D	D	A
Acid, Hydroflouric	C	D	A	A	A	A	D	D	A	A	A	B	A	B	D	D	C	A
Acid, Trifluoroacetic	D	C	C	C	C	D	D	D	A	A	D	D	A	D	D	D	D	A
Acid, Acetic Dilute 50%	A	C	B	B	A	A	D	B	A	A	A	A	A	B	D	B	D	A
Acid, Hydrochloric 37%	C	D	A	A	A	A	D	D	A	A	B	B	A	B	A	C	C	A
Acid, Nitric	B	D	A	A	B	C	D	B	A	A	A	B	A	B	C	C	C	A
Acid, Sulfuric	D	D	A	A	A	B	D	C	A	A	B	C	A	B	D	C	D	A
Actonitrile	D	D	A	A	A	A	A	D		A	C	C	A	D		D	C	A
Alcohol, Ethyl	A	D	A	A	A	B	D	B	A	A	B	B	A	B	B	B	C	A
Alcohol, Isobutyl	A	A	A	A	A	A	D	B	A	A	A	A	A	B	B	B		A
Alcohol, Methyl	D	B	A	A	A	A	D	B		A	A	A	A	B	D	C	C	A
Alcohol, n-Buty	A	A	A	A	A	A	D	C	A	A	B	A	A	A	B	B	B	A
Alcohol, Propyl	B	A	A	A	A	A	D	D	A	A		A	A	A		A		A
Ammonium Hydroxide	B	A	A	A	A	A	C		A	A	B	B	A	B	C	B	D	A
Aniline	D	B	A	A	B	B	B	B	A	A	B	B	A	B	D	D	D	A
Aqua Regia	D	D	B	C	C	D	D	D	A	A	D	D	A	C		D		A
Benzaldehyde	B	A	B	B	A	B	B	C	A		B	A	A	D		D	D	A
Benzene	D	A	B	B	D	D	A	D	B	A	B	B	D	A		D	D	A
Carbon Tetrachloride	D	B	A	A	C	B	A	D	A	A	D	B	A	B	D	D	D	A
Caustic Soda (NaOH)	B	B	A	A	A	B	B	D	A	A	A	A	A	D	D	A	D	A
Chlorobenzene	D	D	B	B	C	D	B	D	A	A	C	D	A	D		D		A
Cloroform	D	B	B	B	C	C	D	D	B	A	D	B	A	C		D	D	A
Cyclohexane	A	A	B	B	C	C	A	D	A	A	D	C	A	D	D	D		A
Esters	D	D	A	A	B	B	A	D	B	A	B	B	A	C		D		A
Ether	D	A	B	B	C	D	A	C	B	A	D	D	A	D		D	D	A
Ether, Diethyl	D	D	B	B	D	A	C	D	C	A	D	D	A	D	C	D	D	A
Ether, Isopopyl	B	A	A	A	A	A	B	A	A	A	A	D	A	A	A	A	A	A
Ethtyl, Methyl	D	B	A	A	B	A	B	D	A	A	D	B	A	D	D	D	D	A
Hexane	D	B	A	A	B	D	A	C	A	A	C	B	A	C	C	D	A	A
Hydrazine	B	B	A	A				D	B	A	D	C	A	C	D	D		A
Hydrogen Peroxide	B	B	A	A	A	D	B	A	A	A	A	A	A	A	A	B		A
Methylene Chloride	D	B	A	A	C	D	A	D	A	D	C	C	A	D	C	D	D	A
Petroleum Ether	B	A	A	A	A	B	A	A		A		A	A	B	D	B		A
Phenol	D	C	A	A	D	D	D	D	A	A	D	D	A	C	D	C	D	A
Sodium Hydroxide	B	D	A	A	A	B	B	D	A	A	A	B	A	B	D	A	C	A
Tetrahydrofuran	D	A	A	A	B	C	A	D	A	D	C	B	A	D	D	D	D	A
Toluene	D	B	A	A	B	C	C	D	A	A	C	C	A	D	D	D		A
Trichloroethylene	D	B	B	B	C	D	B	D	A	A	D	D	A	D	D	D	D	A
Trimethylpentane,2,2,4	D	C	B	B	C	C	A	D		A	C	C	A	D	D	D	D	A
Water	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Xylene	D	A	A	A	C	D	A	D	A	A	C	C	A	D	D	D	D	A

Making the Right Liner Choice:
Liner Type

- Pressure Sensitive Foam
- Glue Bonded (glassine)
- Standard Reseal Liner
- Induction Seal
- Conduction Seal (Yogurt Lidding)

Making the Right Liner Choice:
Backing Type

- Paper
- Board
- Pulp
- Foam
- Unsupported (Conduction only)

Making the Right Liner Choice

Liner Construction

- One piece
- Two piece
- Two piece barrier seal

Performance Characteristics

- Tamper Evident/Welded Seal
- Clean Peel
- Venting Solutions
- Easy Entry

Making the Right Liner Choice:
Product Being Packaged

- Food
- Beverage
- Pharmaceutical
- Chemical
- Personal care

Making the Right Liner Choice:
Characteristics of Product Being Packaged

- Dry
- Viscous
- Liquid
- High acid
- Aggressive ingredient

Making the Right Liner Choice:
Product Filling Process

- Cold Fill
- Hot Fill
- Retort
- Pasteurization
- Aseptic
- Other

Making the Right Liner Choice:
Consumer Convenience Tabs

- Lift ‘n’ Peel™ (One Piece)
- Tri-tabs
- Folded back tab (Pull Tab)
- Folded down tab
- Top-Tab™ (Two Piece)

Making the Right Liner Choice:
Closure Style

- Continuous thread
- Dispensing
- Interrupted thread
- Snap
- CRC

Questions for your customer to help determine liner type

- What type of liner? (Standard gasket, pressure sensitive, heat seal)
- Plain or printed liner?
- What is the material of container?
- What is the product being packaged? Dry or liquid?
- Do you need a vented liner?
- Liner material preference, if any? (pulp, foam, chipboard)
- Application (automotive, pharma, nutra, etc.)
- Filling process?

Lining Material Cross Reference Guide

TRI SEAL™ A TEKNI-PLEX COMPANY

Induction Heat Seal Product Guide

1-Piece Structures

Tri-Seal™ Liner Code			Container Material	Seal Features	Heat Seal Structure	Food - Dry	Foods - Wet	Food - Oil	Beverage	Pharma - Dry	Pharma - Wet	Cosmetics	Auto Fluids	Chemical - Dry	Chemicals - Mild	Chemical - Aggressive	Cross Reference
Flemington	Triadelphia	Alliance															Selig FoilSeal®
Paper Backed																	
TSPE/8	HSP-1/10	HS056	PE	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	.008" C1S FS M-1, SG 75M
TSPEEE/8	HSP-1.0/10		PE	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	×	✓	×	✓	×	✓	✓	✓	×	×	.008" C1S FS 1-7, SG 100
TSPPE/8	HSP-2/10		PE, PP	CP	1.0 Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	.008" C1S FS 1-15
TSPPEEE/8	HSP-2.0/10		PE, PP	CP	1.0 mil Foil / 2.0 mil HeatSeal	✓	×	✓	×	✓	×	✓	✓	✓	×	×	.008" C1S FS 1-13
TSPPELA/8	HSP-2.1/10		PE, PP	CP	0.5 mil Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	.008" C1S FS 1-18
TSPPEEELA/8	HSP-2.2/10		PE, PP	CP	0.5 mil Foil / 2.0 mil HeatSeal	✓	×	✓	×	✓	×	✓	✓	✓	×	×	.008" C1S FS 1-16
TSPET/8	HSP-3/10	HS906	PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	.008" C1S FS 3-19, SG 90
TSPETLA/8	HSP-3.1/10		PET, PVC	CP	0.5 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	.008" C1S FS 3-25
	HSP-4/10		PP	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	.008" C1S FS M-4
TSPP/8	HSP-4.0/10		PP	WS, TE	1.0 mil Foil / 2.0 mil HeatSeal	✓	×	✓	×	✓	×	✓	✓	✓	×	×	.008" C1S FS 4-6
	HSP-5.0/10		Universal	WS, TE	1.0 mil Foil / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	
	HSP-5.6/10	HS035	Universal	WS, TE	0.35 mil Foil / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	
TSUNI/8			Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	.008" C1S FS 5-8
TSUNIPEEL/8			Universal	CP	1.0 Foil / 0.9 mil HeatSeal	✓	×	✓	×	✓	✓	✓	×	✓	×	×	.008" C1S FS 5-9
TSUNIVENT/8			Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	×	×	✓	×	×	×	✓	×	×	.008" C1S FS 5-4, FS 5-10
	HSP-5.0A/10		Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	×	×	✓	×	×	×	✓	×	×	
	HSP-5.6A/10	HS02 VENT	Universal	WS, TE, V	0.35 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	×	×	✓	×	×	×	✓	×	×	
Polyolefin Foam Backed																	
TSPE/1	HSF-1/5		PE	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S55/FS M-1, S70/FS M-1, ISPE U5
TSPE/2	HSF-1/10		PE	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S105/FS M-1, ISPE U10
TSPEEE/1	HSF-1.0/5		PE	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S55/FS 1-7, S70/FS 1-7
TSPEEE/2	HSF-1.0/10		PE	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S105/FS 1-7
TSPPE/1	HSF-2/5		PE, PP	CP	1.0 Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S55/FS 1-15, S70/FS 1-15, ISPE/PP U5
TSPPE/2	HSF-2/10		PE, PP	CP	1.0 Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S105/FS 1-15, ISPE/PP U10
TSPPEEE/1	HSF-2.0/5		PE, PP	CP	1.0 Foil / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S55/FS 1-13, S70/FS 1-13
TSPPEEE/2	HSF-2.0/10		PE, PP	CP	1.0 Foil / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S105/FS 1-13
TSPPELA/1	HSF-2.1/5		PE, PP	CP	0.5 Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S55/FS 1-18, S70/FS 1-18
TSPPELA/2	HSF-2.1/10		PE, PP	CP	0.5 Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S105/FS 1-18
TSPPEEELA/1	HSF-2.2/5		PE, PP	CP	0.5 Foil / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S55/FS 1-16, S70/FS 1-16
TSPPEEELA/2	HSF-2.2/10		PE, PP	CP	0.5 Foil / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S105/FS 1-16
TSPET/1	HSF-3/5		PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S55/FS 3-19, S70/FS 3-19, ISCT U5
TSPET/2	HSF-3/10		PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S105/FS 3-19, ISCT U10
TSPETLA/1	HSF-3.1/5		PET, PVC	CP	0.5 mil Foil / 0.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S55/FS 3-25, S70/FS 3-25
TSPETLA/2	HSF-3.1/10		PET, PVC	CP	0.5 mil Foil / 0.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	S105/FS 3-25
TSPETWS/1			PET, PVC	WS, TE	1.0 mil Foil / 0.6 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ISPET/PVC U5
TSPETWS/2			PET, PVC	WS, TE	1.0 mil Foil / 0.6 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	ISPET/PVC U10
	HSF-4/5		PP	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S55/FS M-4 or S70/FS M-4
	HSF-4/10		PP	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S105/FS M-4
TSPP/1	HSF-4.0/5		PP	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	×	✓	×	×	S55/FS 4-6 or S70/FS 4-6, ISPP U5
TSPP/2	HSF-4.0/10		PP	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	×	✓	×	×	S105/FS 4-6, ISPP U10
TSUNI/1			Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	✓	×	✓	×	×	×	×	×	×	S55/FS 5-8 or S70/FS 5-8
TSUNI/2			Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	✓	×	✓	×	×	×	×	×	×	S105/FS 5-8
	HSF-5.0/5		Universal	WS, TE	1.0 mil Foil / 0.9 mil HeatSeal	✓	×	×	×	✓	×	×	×	×	×	×	
	HSF-5.0/10		Universal	WS, TE	1.0 mil Foil / 0.9 mil HeatSeal	✓	×	×	×	✓	×	×	×	×	×	×	
TSUNIPEEL/1			Universal	CP	1.0 mil Foil / 0.9 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S55/FS 5-9 or S70/FS 5-9
TSUNIPEEL/2			Universal	CP	1.0 mil Foil / 0.9 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	S105/FS 5-9
TSUNIVENT/1			Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	✓	×	✓	×	×	×	×	×	×	S55/FS 5-4 or S70/FS 5-4 or S55/FS 5-10 or S70/FS 5-10
TSUNIVENT/2			Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	✓	×	✓	×	×	×	×	×	×	S105/FS 5-10 or S105/FS 5-10
Polystyrene Foam Backed																	
TSUNI/20F			Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	✓	×	✓	×	×	×	×	×	×	
	HSS-5.6/20	HS035	Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	✓	×	✓	×	×	×	×	×	×	HS-035
TSUNIPEEL/20F			Universal	CP	1.0 mil Foil / 0.9 mil HeatSeal	✓	×	✓	×	✓	×	×	×	×	×	×	.020" PS Foam/FS 5-9
	HSS-5.6A/20	HS02 VENT	Universal	WS, TE, V	0.35 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	✓	×	✓	×	×	×	×	×	×	

CP = Clean Peel (no residue), EE = Easy Entry, TE = Tamper Evident, V = Venting, WS = Weld Seal; Universal = various plastic bottle materials and glass, ✓ = Recommended, × = Not Recommended

The customer is responsible to test and determine the fit to use. Above cross references are based on the liner structural and functional similarities.

Information provided as a guide; consult your Tri-Seal / Tech-Seal representative to discuss your specific application.

Tri-Seal/Tech-Seal Sales Contacts

Andrew Barrowcliff (East) (248) 660-6469 (t) (215) 499-2688 (m) Joseph Farrell (Midwest) 973-762-2356 (t) 908-285-7583 (m) Andy Jacobs (West) 916-774-2856 (t) 916-759-7010 (m)
Rick McKenna 732-325-7019(m) Paul Yousif (Midwest) 630-259-7147 (m)

For contact at other global locations, or for more information, please also e-mail us at: http://tri-seal.tekni-plex.com/

Lining Material Cross Reference Guide

TRI SEAL™ A TEKNI-PLEX COMPANY

Induction Heat Seal Product Guide

2-Piece Structures

Tri-Seal™ Liner Code			Container Material	Seal Features	Heat Seal Structure	Food - Dry	Foods - Wet	Food - Oil	Beverage	Pharma - Dry	Pharma - Wet	Cosmetics	Auto Fluids	Chemical - Dry	Chemicals - Mild	Chemical - Aggressive	Cross Reference
Flemington	Triadelphia	Alliance															Selig FoilSeal®
Backing: Pulp, Wax-bonded																	
HS130	HSL-1	HS056	PE	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	FS M-1, SG 75M
HS123	HSL-1.0		PE	WS, TE, EE	1.0 mil Foil / 1.5 mil HeatSeal	✓	×	✓	×	✓	×	✓	✓	✓	×	×	FS 1-7, SG 100
HS135	HSL-2		PE, PP	CP	1.0 Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	FS 1-15
HS125	HSL-2.0		PE, PP	CP, EE	1.0 mil Foil / 2.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	FS 1-13
HS134	HSL-2.1		PE, PP	CP	0.5 mil Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	FS 1-18
HS124	HSL-2.2	HS906	PE, PP	CP, EE	0.5 mil Foil / 2.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	FS 1-16
HS165	HSL-3		PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	FS 3-19, SG 90
HS164	HSL-3.1		PET, PVC	CP	0.5 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	FS 3-25
HS8501			PET, PVC	WS, TE	1.0 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	✓	FS 3-31
	HSL-4		PP	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	FS M-4
HS128	HSL-4.0		PP	WS, TE	1.0 mil Foil / .002" HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	FS 4-6, SG 101
HS205			Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	×	×	×	FS 5-8
	HSL-5.6	HS035	Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	×	×	×	
HS225			Universal	CP	1.0 Foil / 0.9 mil HeatSeal	✓	×	×	×	✓	×	✓	×	×	×	×	FS 5-9
HS245			Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	FS 5-4, FS 5-10
	HSL-5.0A	HS 02 Vent	Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	
Backing: PP foam-Polyester, Wax-bonded																	
Tri-Gard II-TSPEEE			PE	WS, TE	1.0 mil Foil / 1.5 mil Heat Seal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25 LE FS 1-7
Tri-Gard II-TSPE			PE	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	C25 LE FS M-1
Tri-Gard II-TSPET			PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	C25 LE FS 3-19
Tri-Gard II-TSPETLA			PET, PVC		0.5 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	C25 LE FS 3-25
Tri-Gard II-TSPETWS			PET	WS, TE	1.0 mil Foil / 0.6 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	✓	C25 LE FS 3-31
Tri-Gard II-TSPP			PP	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25 LE FS 4-6
Tri-Gard II-TSPPE			PE, PP	CP	1.0 mil Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	×	×	C25 LE FS 1-15
Tri-Gard II-TSPPEEE			PE, PP	CP	1.0 mil Foil / 2.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25 LE FS 1-13
Tri-Gard II-TSUNI			Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25 LE FS 5-8
Tri-Gard II-			Universal	CP	1.0 mil Foil / 0.9 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25 LE FS 5-9
Tri-Gard II-			Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25P FS 5-4, C25P FS 5-10
Backing: Foam-paper, Wax-bonded																	
Tri-Gard III-TSPEEE			PE	WS, TE, EE	1.0 mil Foil / 1.5 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25P FS 1-7
Tri-Gard III-TSPE			PE	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	C25P FS M-1
Tri-Gard III-TSPET			PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	C25P FS 3-19
Tri-Gard III-TSPETLA			PET, PVC	CP	0.5 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	C25P FS 3-25
Tri-Gard III-			PET	WS, TE	1.0 mil Foil / 0.6 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	✓	C25P FS 3-31
Tri-Gard III-TSPPE			PE, PP	CP	1.0 mil Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	C25P FS 1-15
Tri-Gard III-TSUNI			Universal	WS, TE	2.5 mil White Paper / 0.35 mil Foil / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25P FS 5-8
Tri-Gard III-			Universal	CP	1.0 mil Foil / 0.9 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25P FS 5-9
Tri-Gard III-			Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	×	×	×	✓	×	✓	×	✓	×	×	C25P FS 5-4, C25P FS 5-10
Backing: PO foam, Waxless-bonded																	
Tri-Gard IV-TSPEEE			PE	WS, TE, EE	1.0 mil Foil / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	×	✓	×	×	
Tri-Gard IV-TSPE			PE	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	
Tri-Gard IV-TSPET			PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	
Tri-Gard IV-TSPETLA			PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	
Tri-Gard IV-			PET	WS, TE	1.0 mil Foil / 0.6 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Tri-Gard IV-TSPP			PP	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	×	✓	×	×	
Tri-Gard IV-TSPPE			PE, PP	CP	1.0 mil Foil / 0.5 mil PET / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	
Tri-Gard IV-TSPPEEE			PE, PP	CP, EE	1.0 mil Foil / 2.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	×	✓	×	×	
Tri-Gard IV-			Universal	CP	1.0 mil Foil / 0.9 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	×	✓	×	×	
Tri-Gard IV-			Universal	WS, TE, V	1.0 mil Foil / 2.5 mil White Paper / 1.0 mil HeatSeal	✓	✓	✓	✓	✓	✓	✓	×	✓	×	×	
Backing: Pulp-PVDC coated Polyester, Wax-bonded																	
	LSM//HSP-1.0		PE	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	×	×	E FS 1-7
	LSM//HSP-1		PE	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	E FS M-1
	LSM//HSP-3		PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	×	×	E FS 3-19
	LSM//HSP-4		PP	WS, TE	1.0 mil Foil / 0.5 mil PET / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	×	×	E FS M-4
Backing: PP foam-Polyester, Adhesive-bond																	
Tri-Gard SPE			PE	WS, TE	1.0 mil Foil / 1.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	
Tri-Gard SPET			PET, PVC	CP	1.0 mil Foil / 0.5 mil HeatSeal	✓	×	✓	×	✓	✓	✓	✓	✓	✓	×	

CP = Clean Peel (no residue), EE = Easy Entry, TE = Tamper Evident, V = Venting, WS = Weld Seal; Universal = various plastic bottle materials and glass, ✓ = Recommended, × = Not Recommended

The customer is responsible to test and determine the fit to use. Above cross references are based on the liner structural and functional similarities.

Information provided as a guide; consult your Tri-Seal / Tech-Seal representative to discuss your specific application.

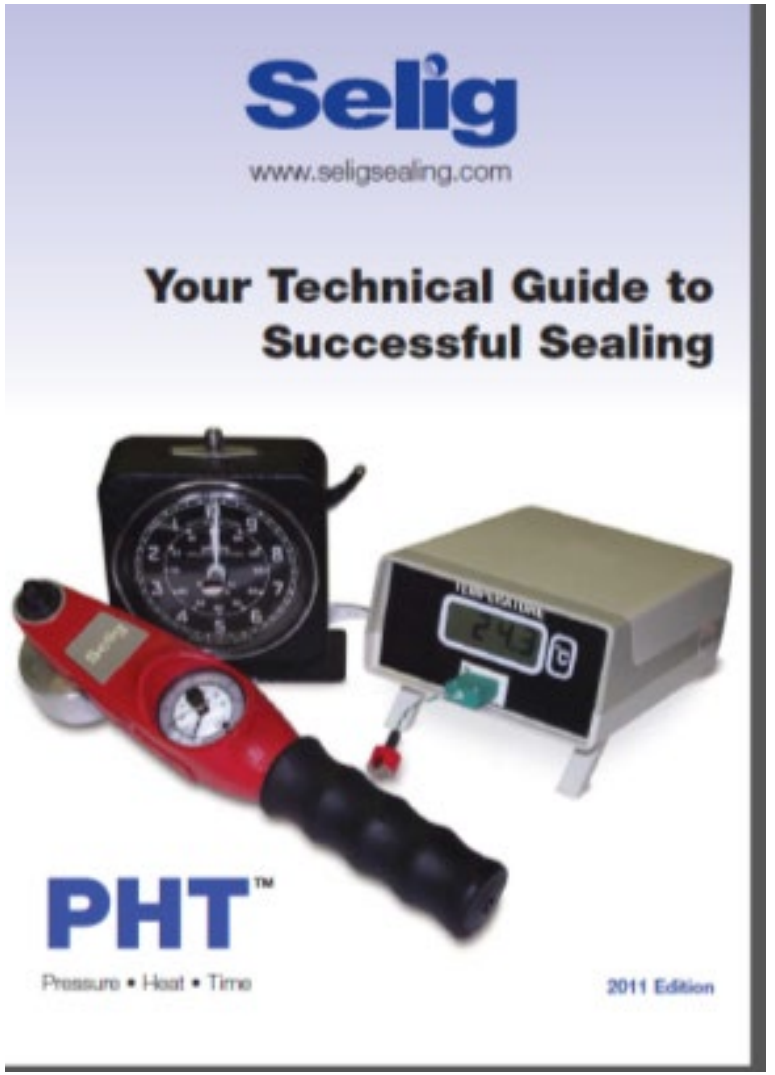
Tri-Seal/Tech-Seal Sales Contacts

Andrew Barrowcliff (East) (248) 660-6469 (t) (215) 499-2688 (m) Joseph Farrell (Midwest) 973-762-2356 (t) 908-285-7583 (m) Andy Jacobs (West) 916-774-2856 (t) 916-759-7010 (m)
Rick McKenna 732-325-7019(m) Paul Yousif (Midwest) 630-259-7147 (m)
For contact at other global locations, or for more information, please also e-mail us at: http://tri-seal.tekni-plex.com/

For Reference

To download a copy visit:

www.seligsealing.com/pht.html



Education links

- Selig Group | Induction Sealing eLearning (seligsealing.com)
- Induction Sealing & Sealers: Induction Cap Sealing - Enercon Industries

Injection Molding – An Introduction

- Plastic materials
- Molding process
- Runner systems
- Mold designs and actions

Types of Plastics

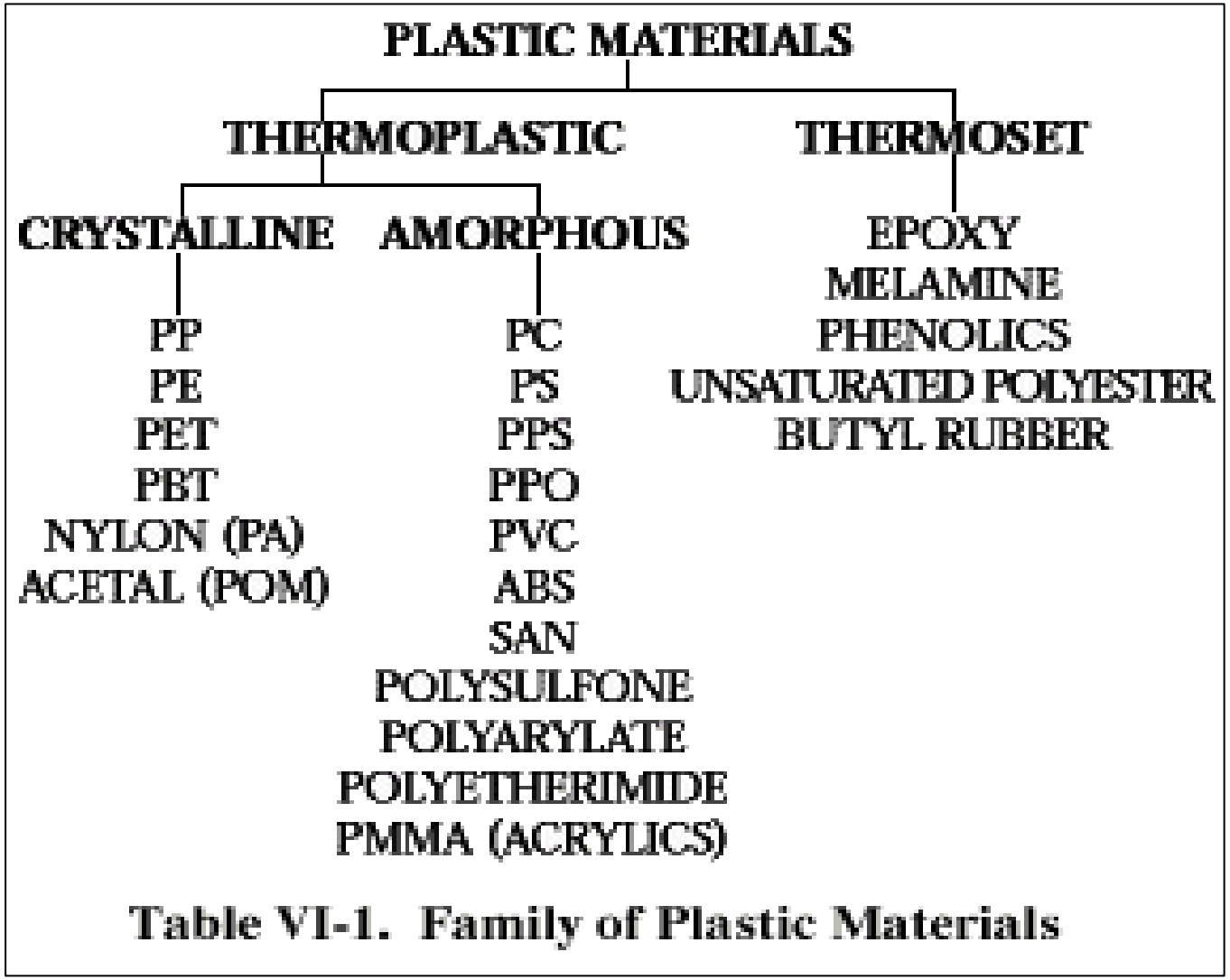
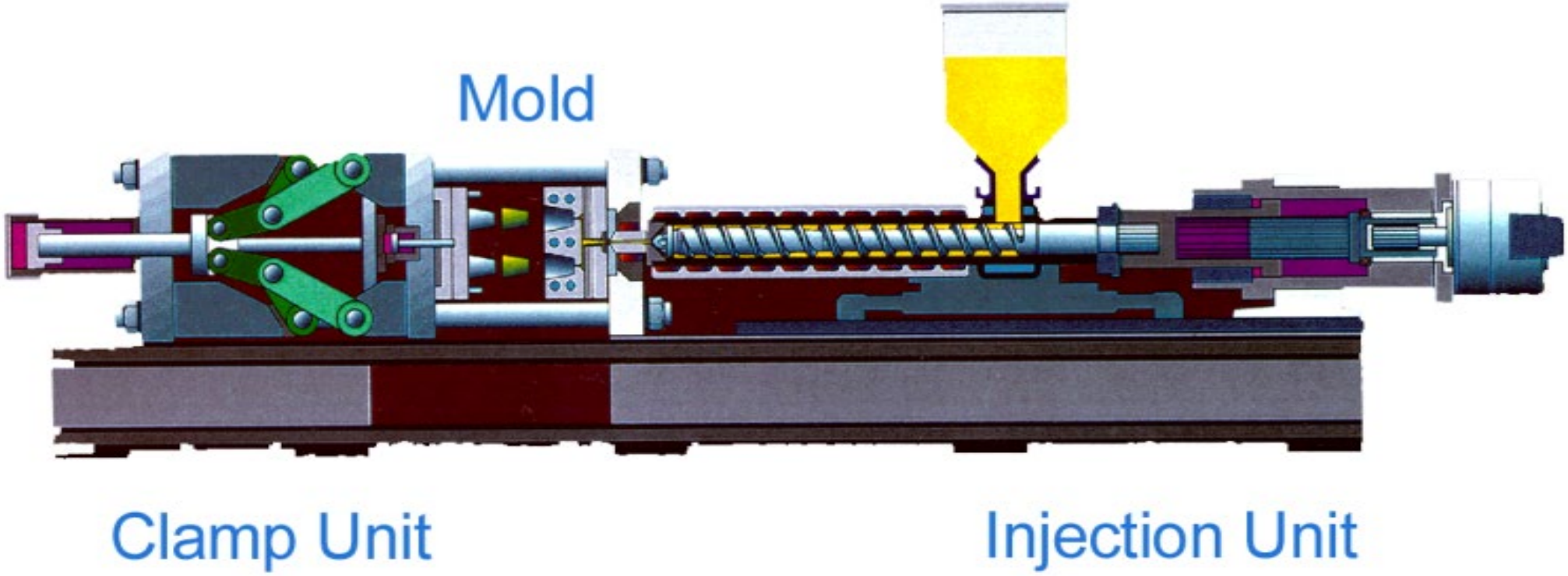


Table VI-1. Family of Plastic Materials

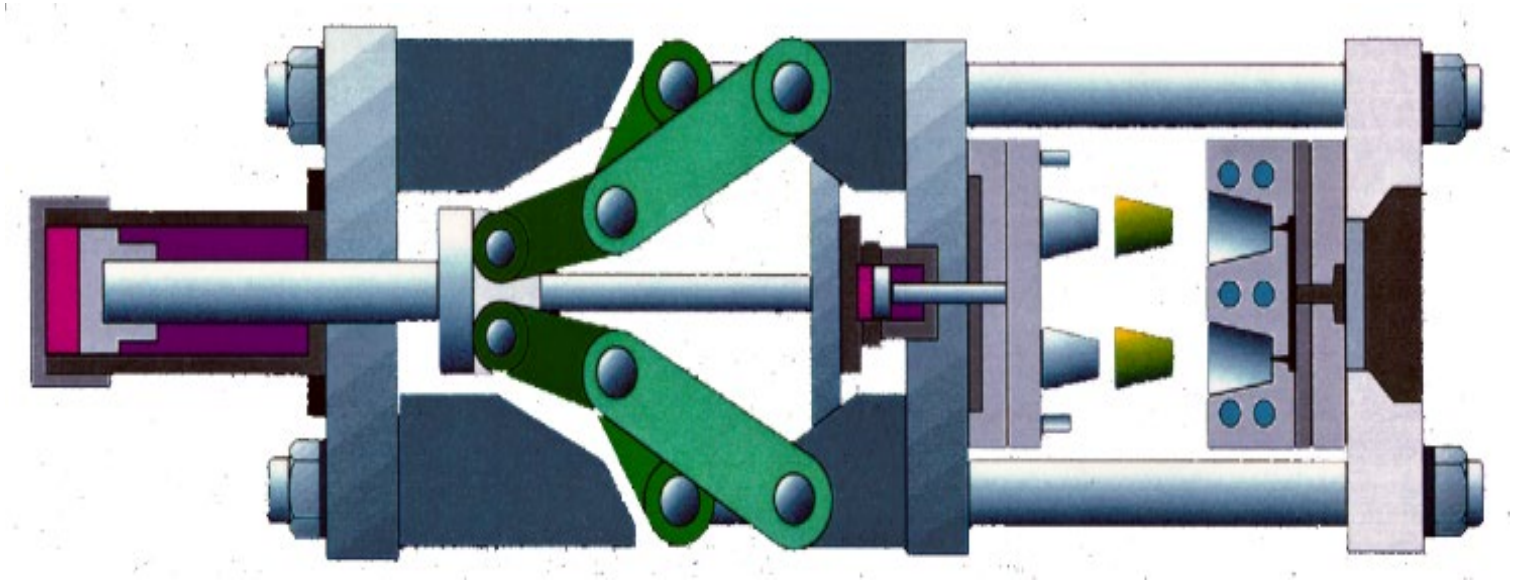
Injection Molding Process

Injection Molding Machine



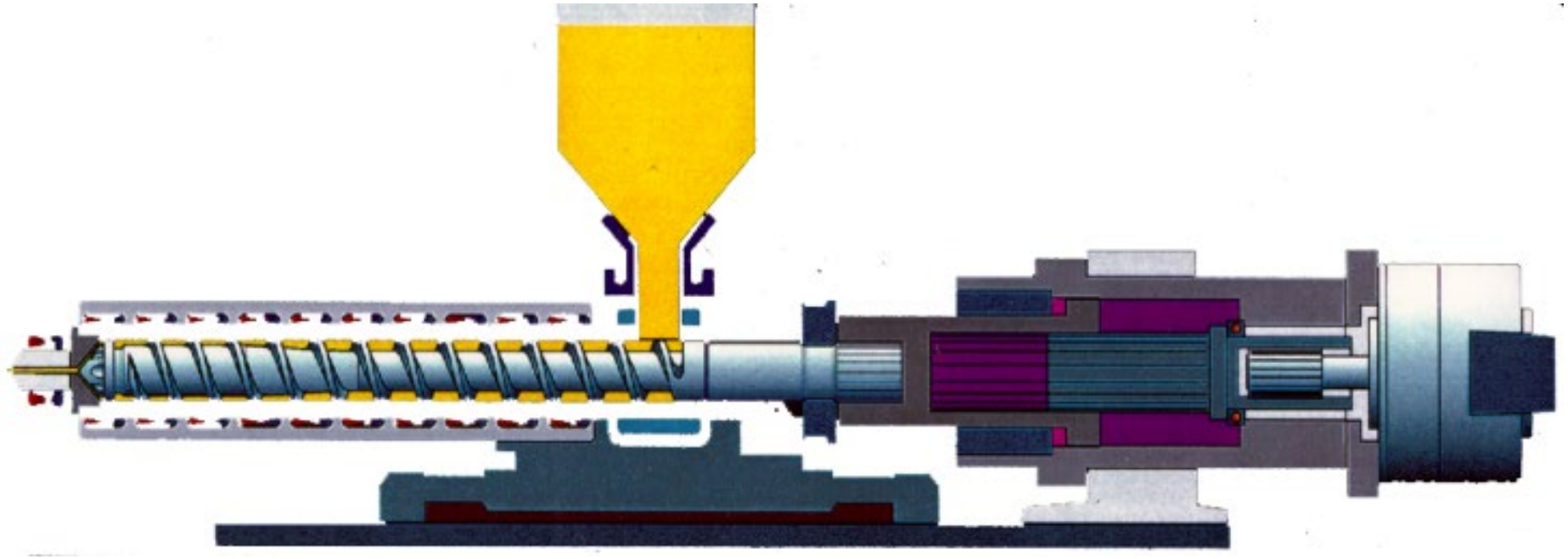
Toggle Clamp

Opens and Closes the Mold
Keeps the Mold Closed
Toggle Clamp is like a vise grip
Toggle Clamp - most of the force is on the corners
Hydraulic Clamp - concentration is on the center portion of the mold (large hydraulic cylinder, not shown)



Injection Unit

Conveys and melts the plastic material
Forces the material into the mold
Pressurizes the plastic in the mold after filling and maintains the pressure until sufficient strength to eject



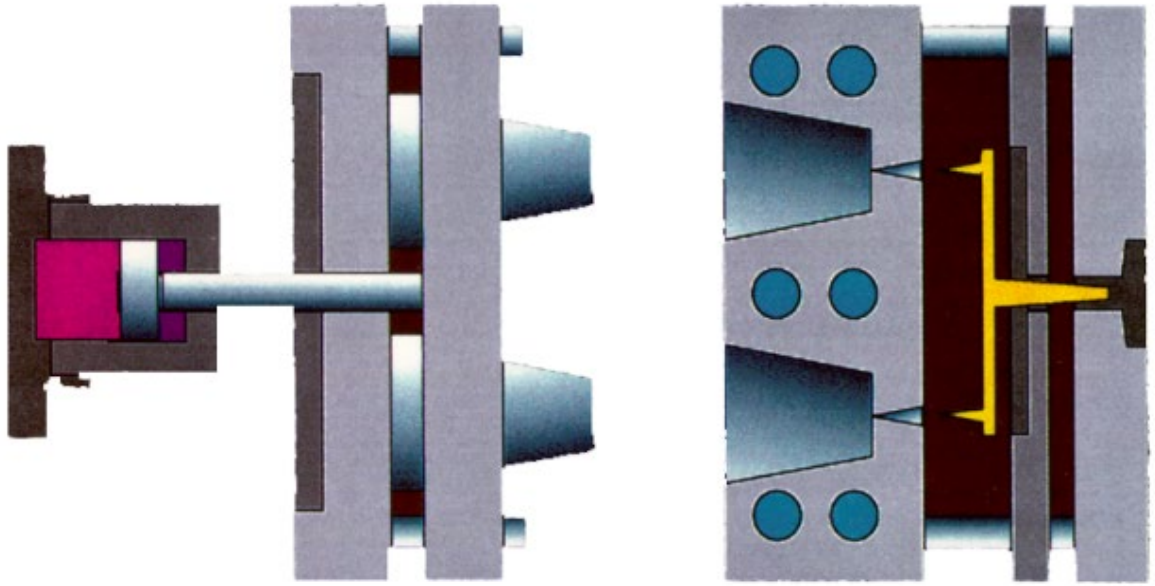
Molding Tool

Molding surfaces (cavities & cores)

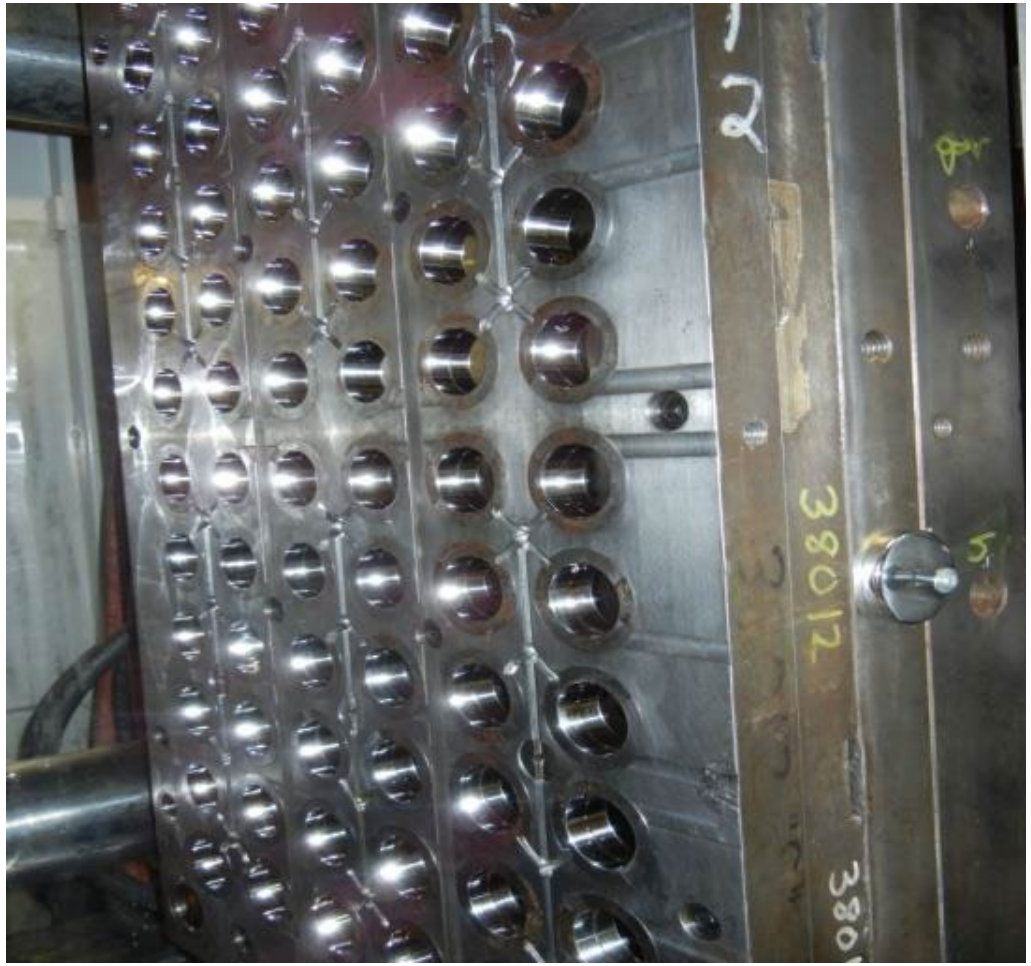
Distribution system (sprues & runners)

Heat exchanger (water lines)

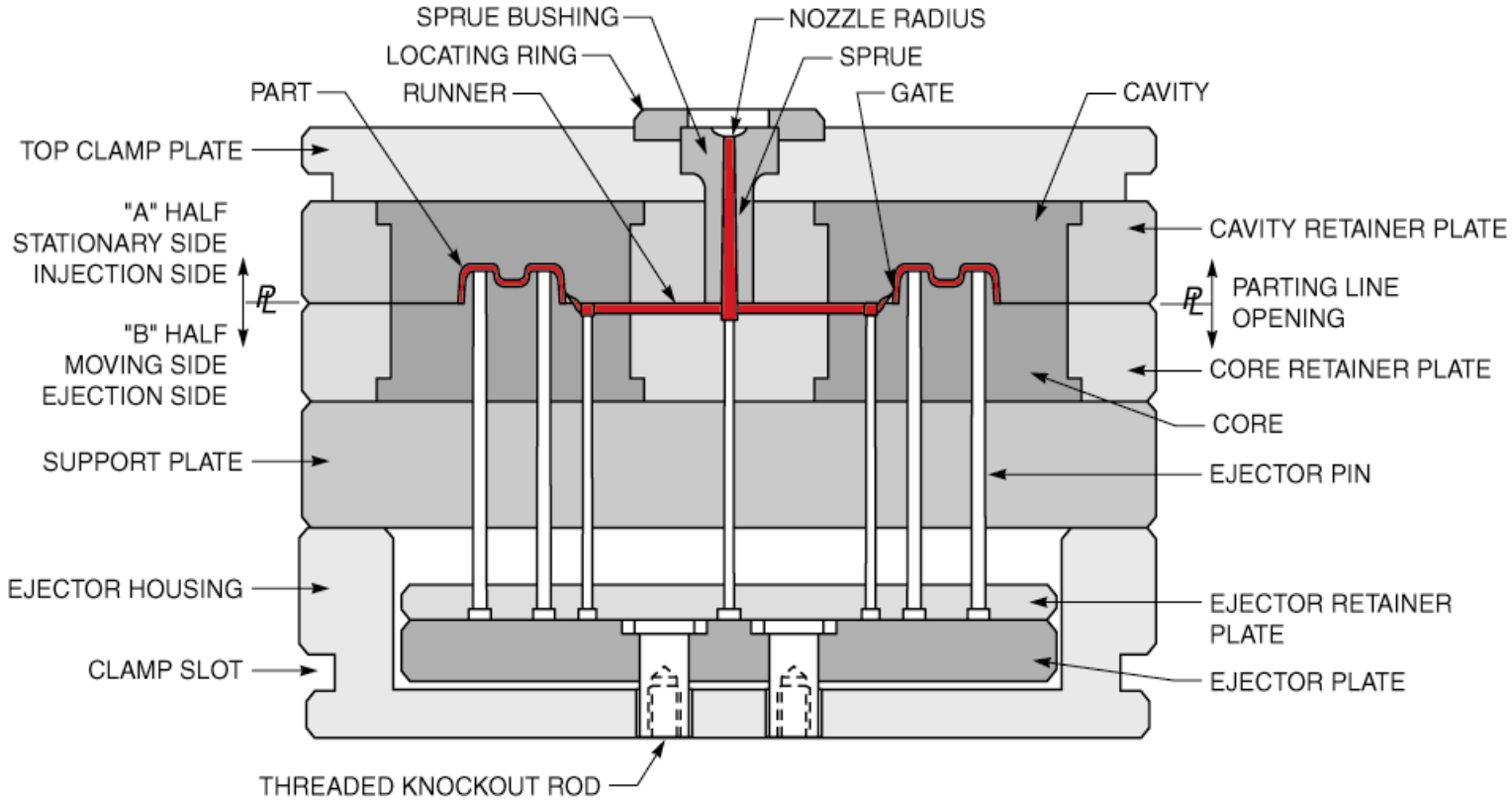
Ejection system



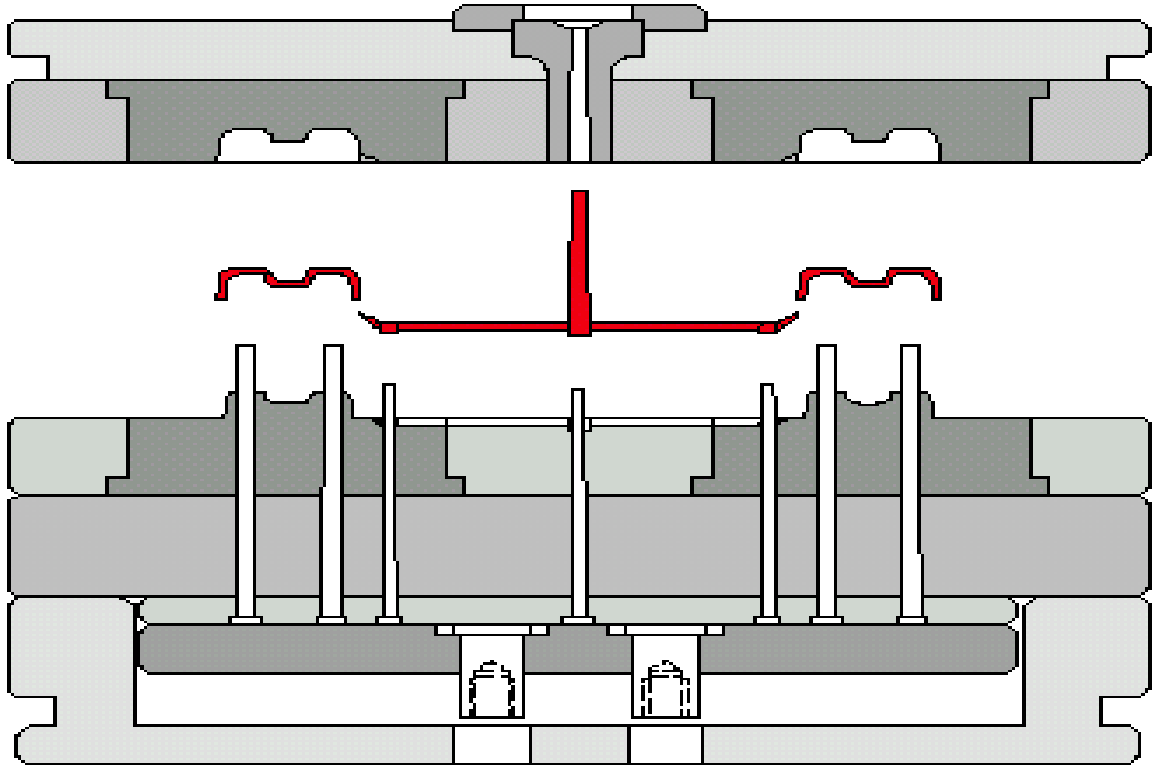
Cold Runner System



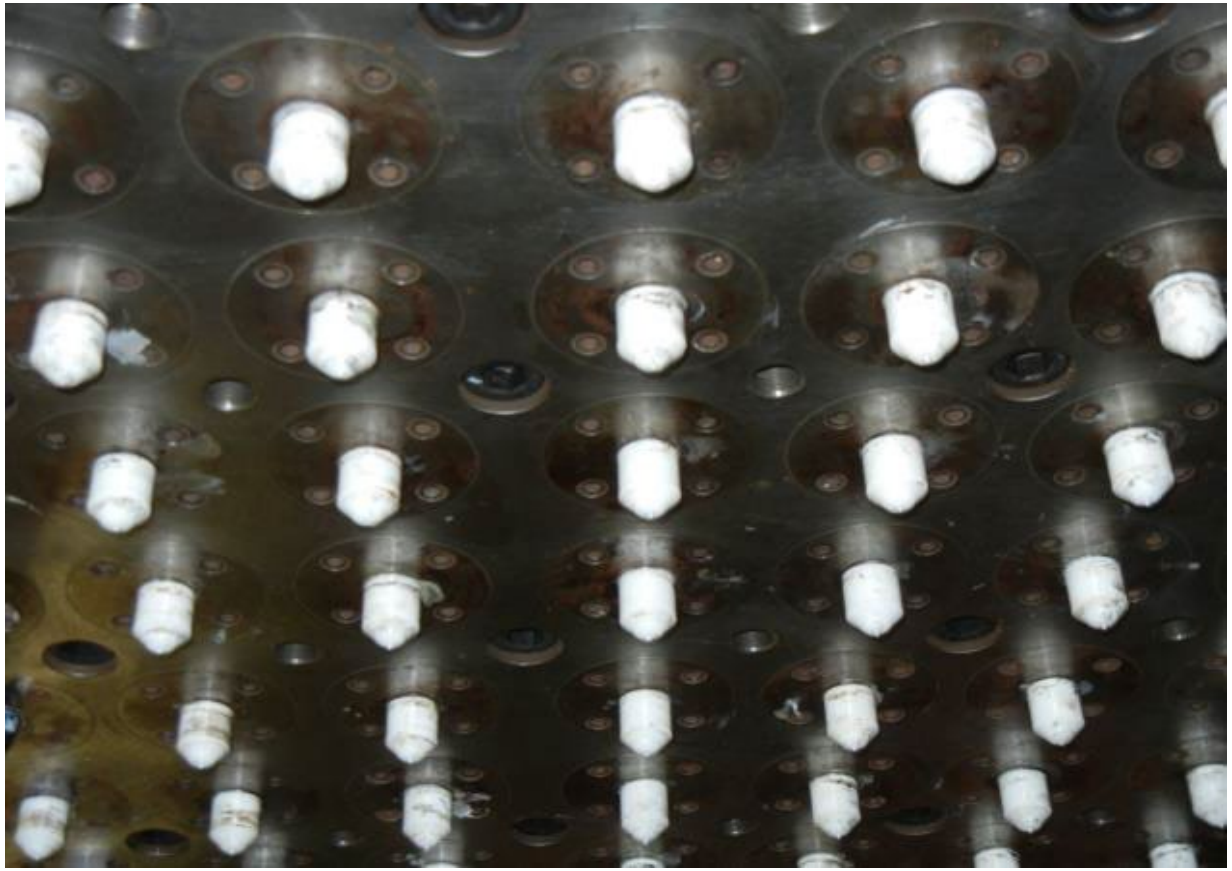
Two-Plate, Cold Runner Injection Mold



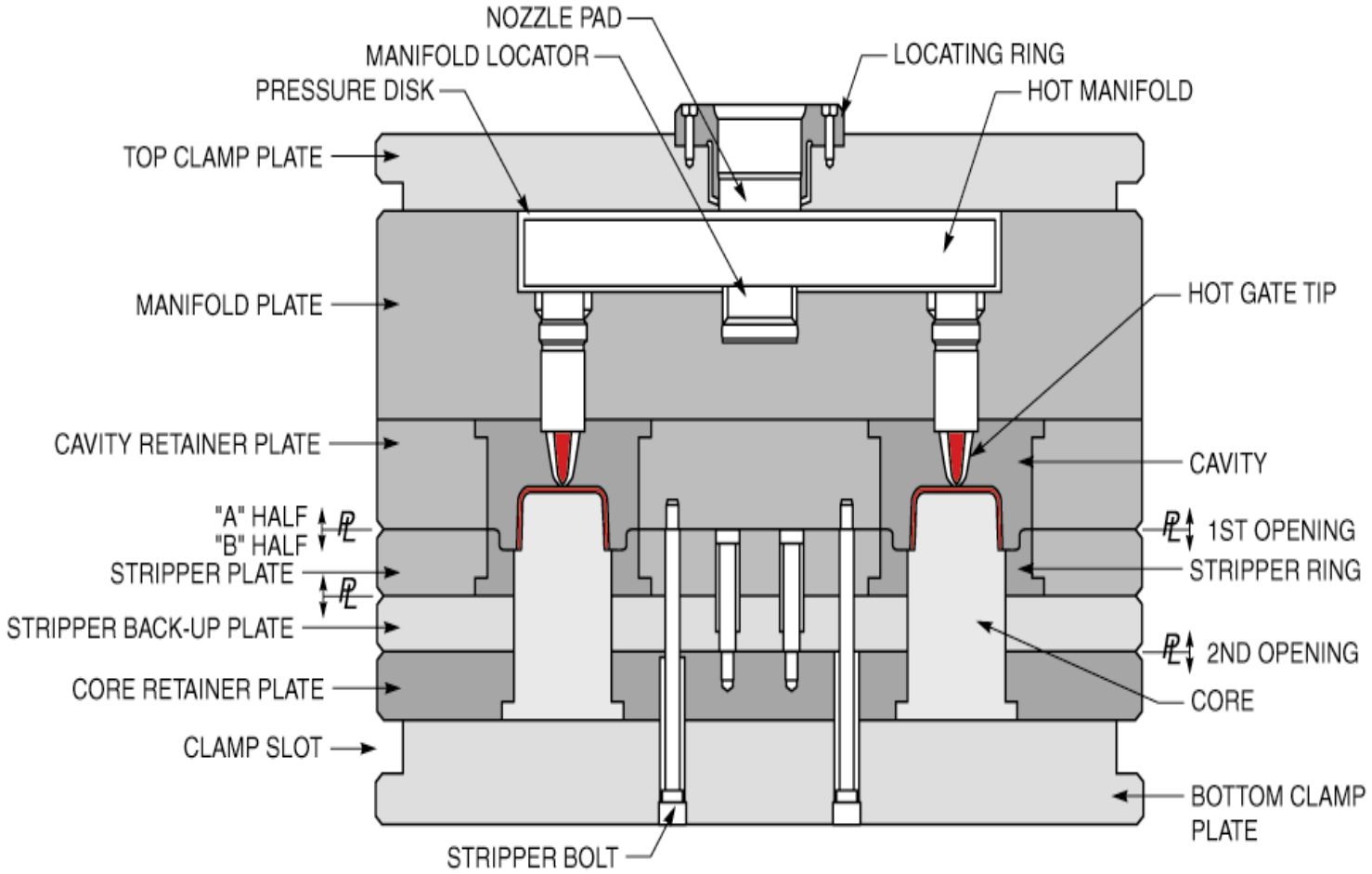
Two-Plate, Cold Runner Injection Mold



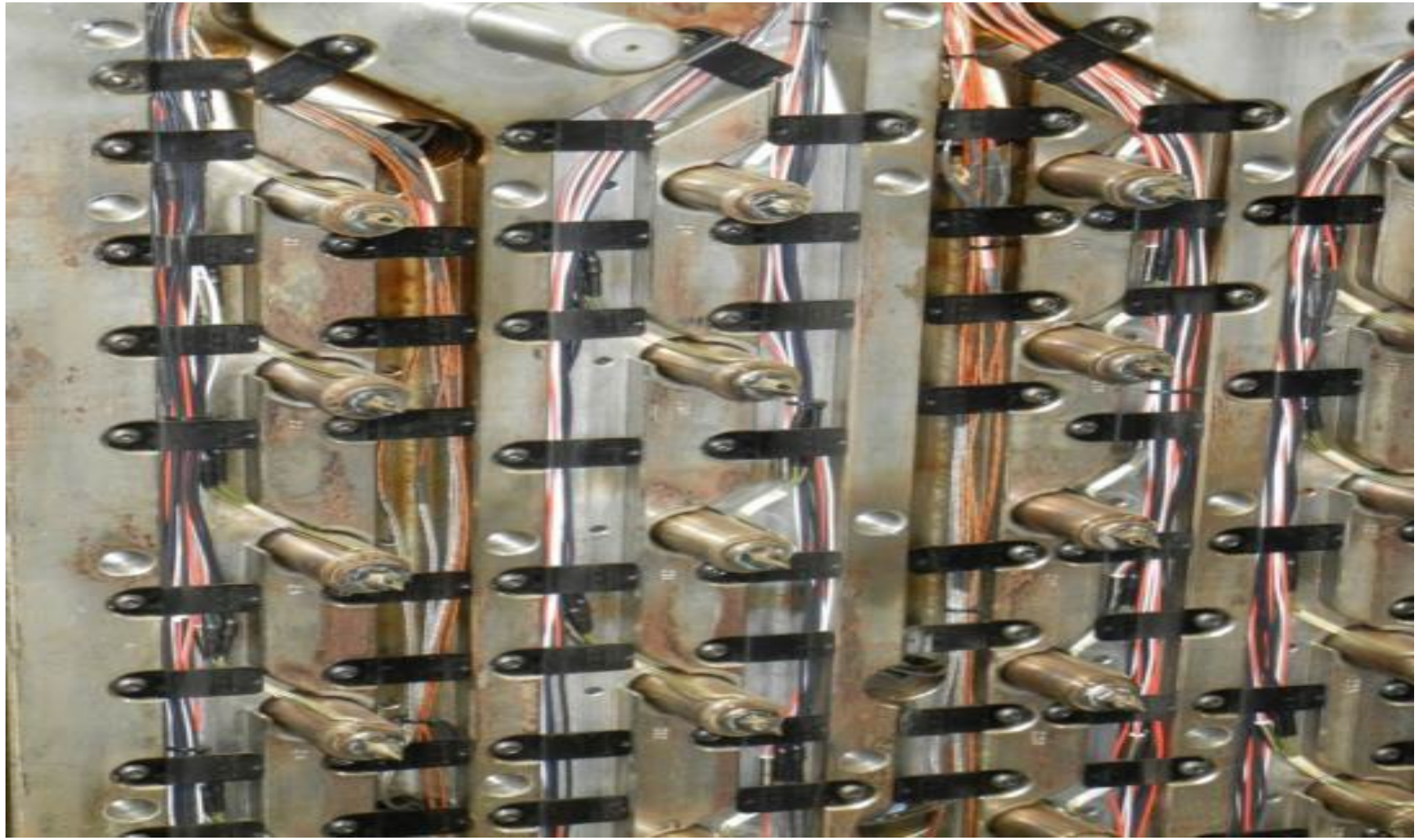
Manifold to Deliver Plastic to Mold



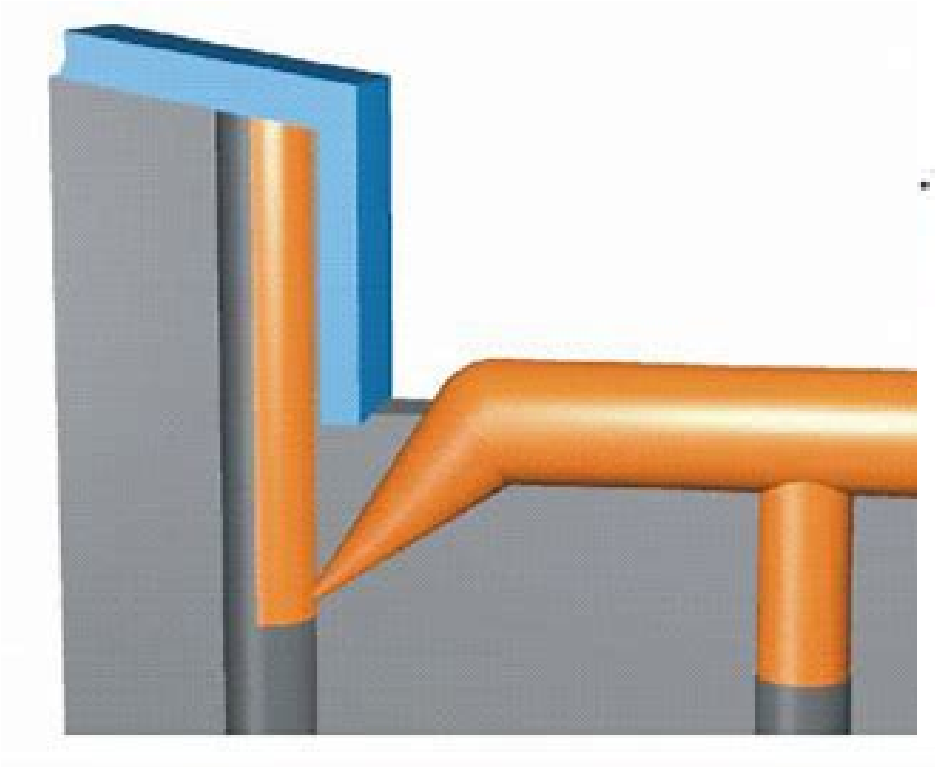
Hot Runner Injection Mold, With Stripper Plate

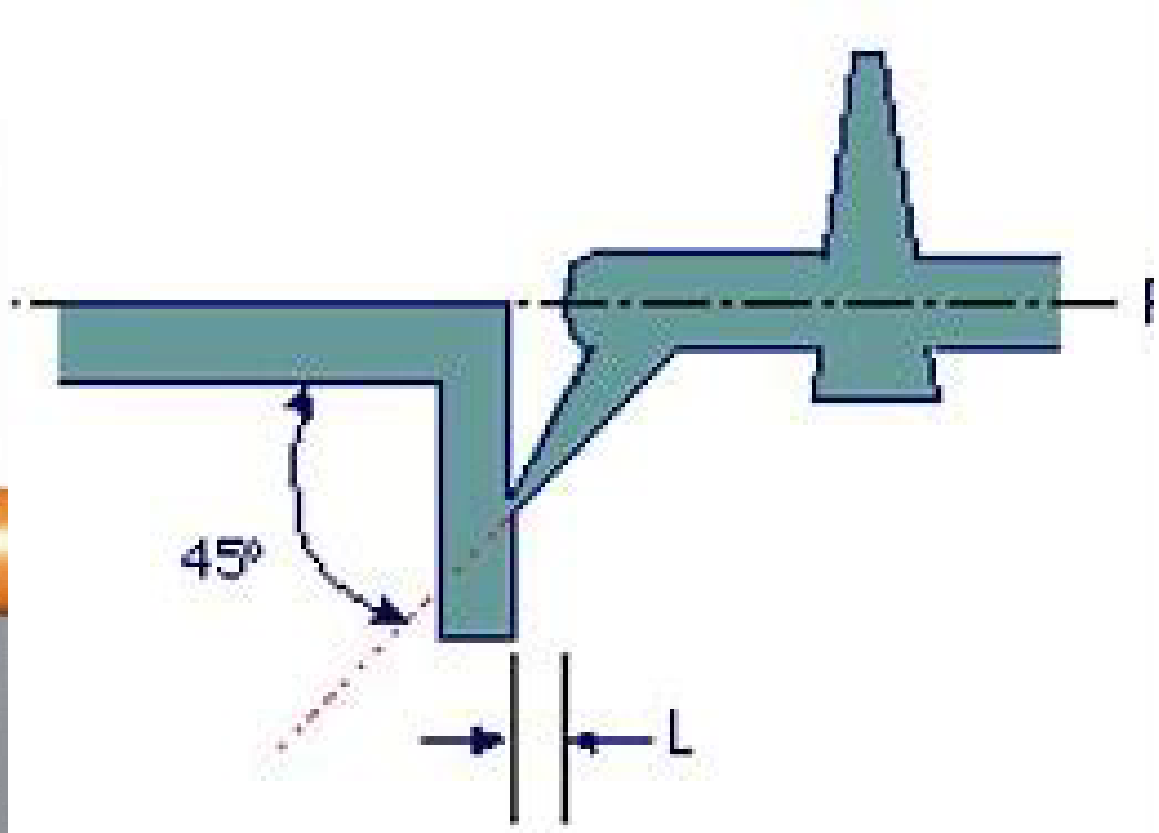


Heating System



Freeze Gate

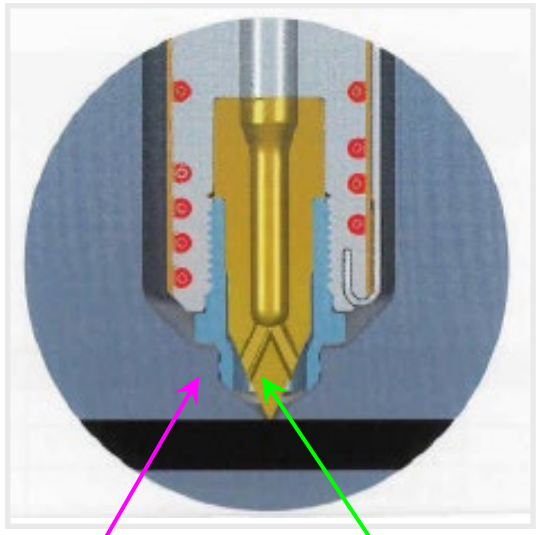




Hot Runner Gating

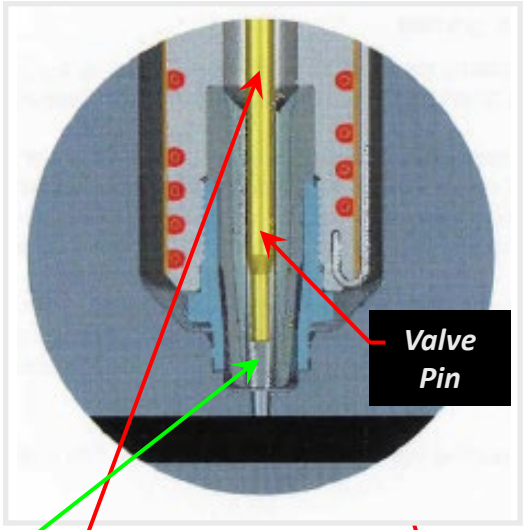
Hot Tip Gate

Material "freezes" to "close" the gate



Hot Valve Gate

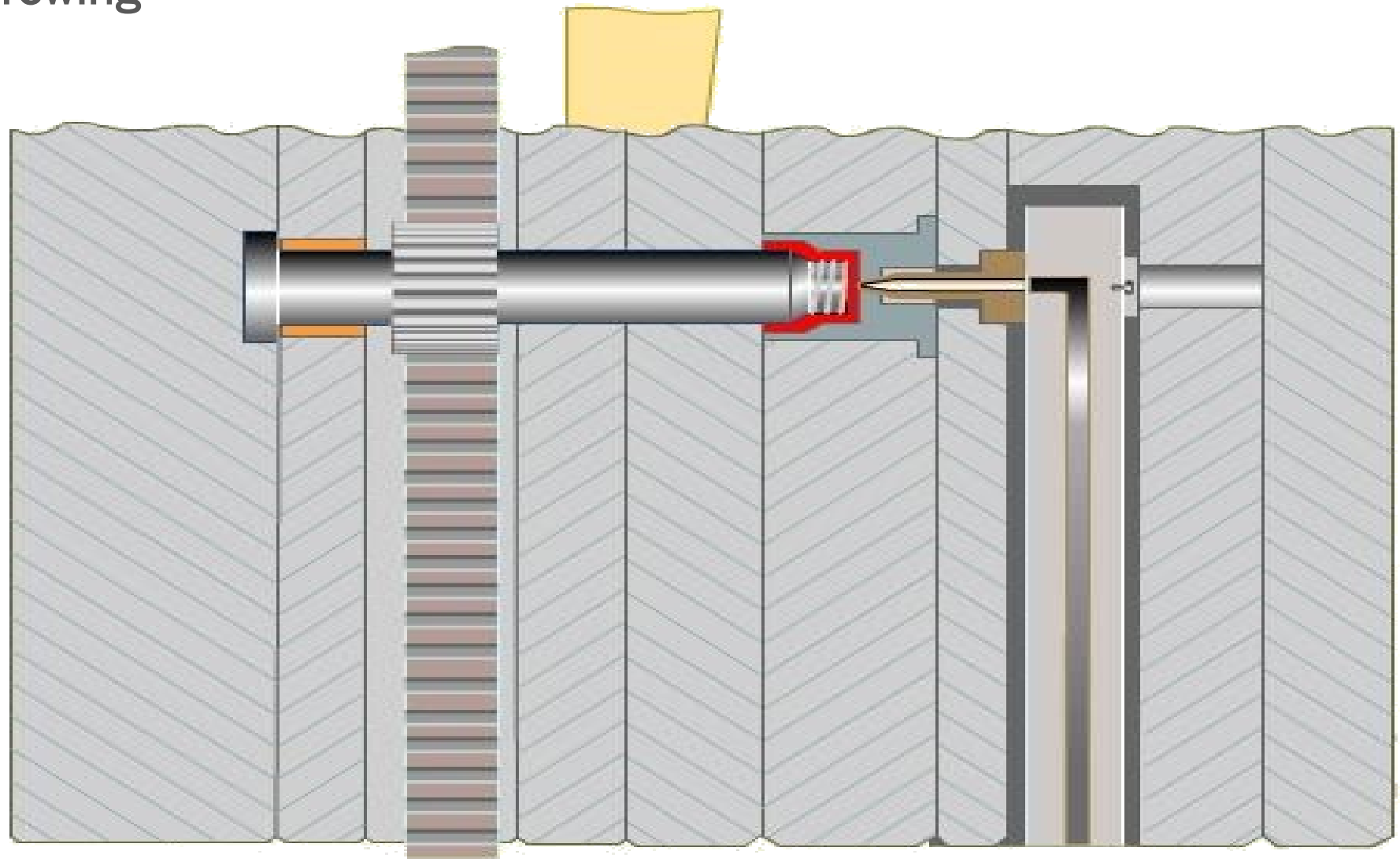
Mechanically closes the gate



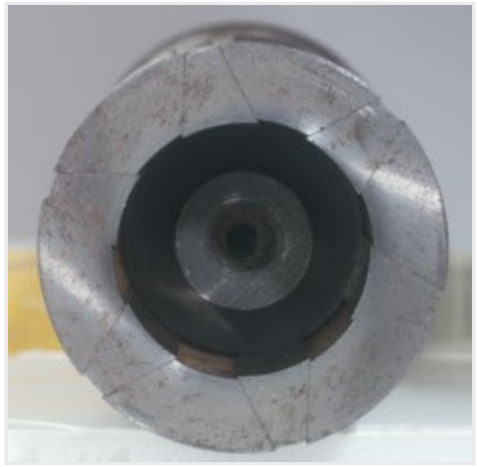
- *Injection - Pressure opens Gate*
- *Material freezing when injection pressure stops closes Gate*

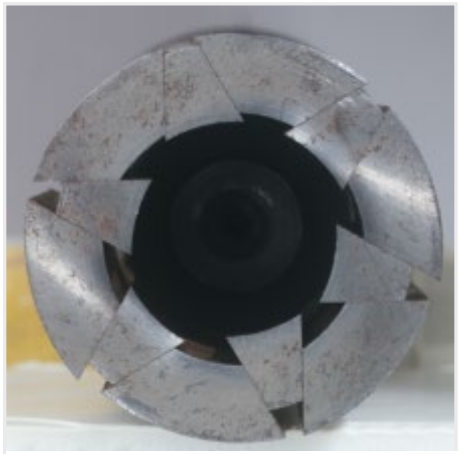
Unscrewing Mold

Rack & Pinion Unscrewing

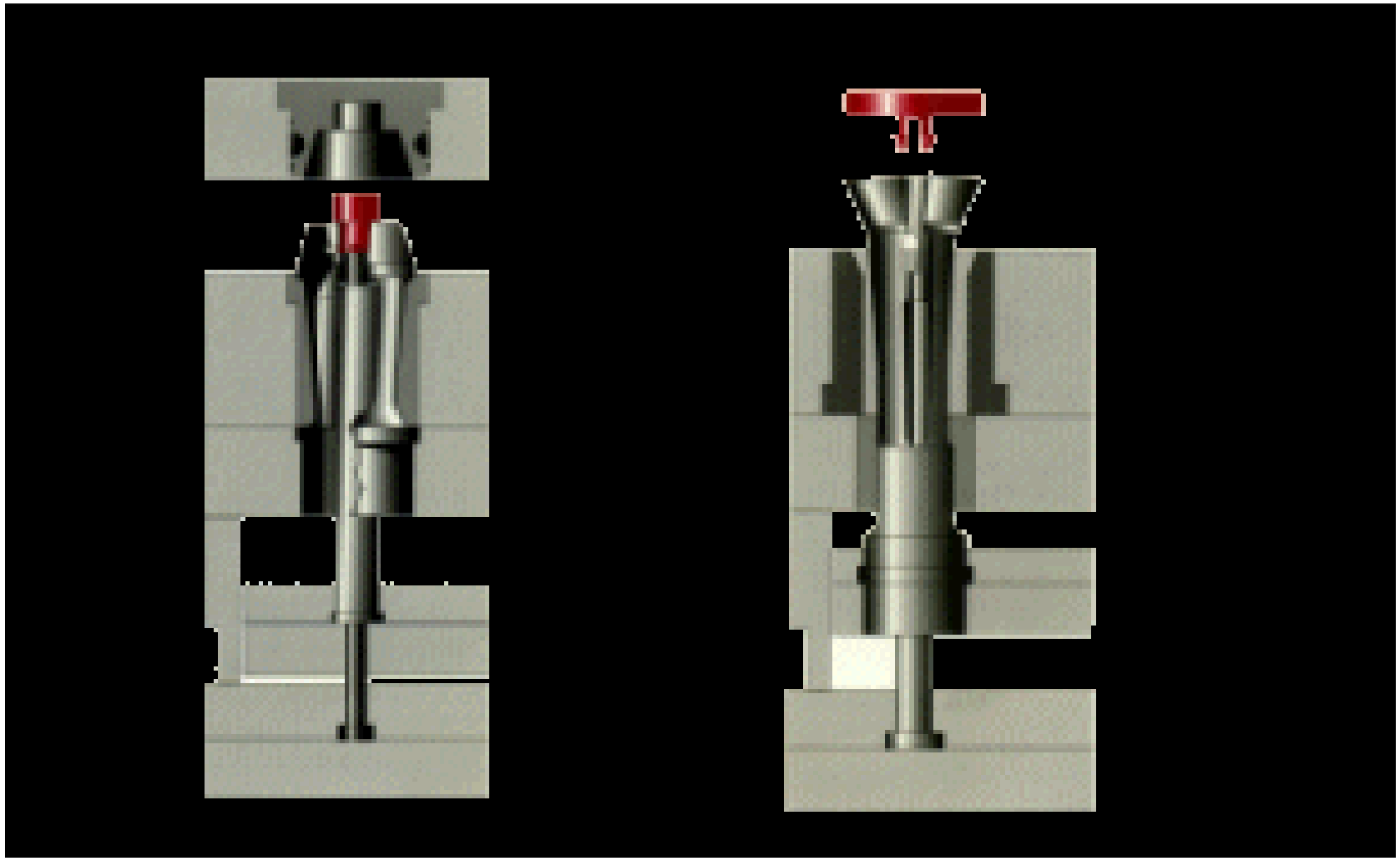


Collapsing Core

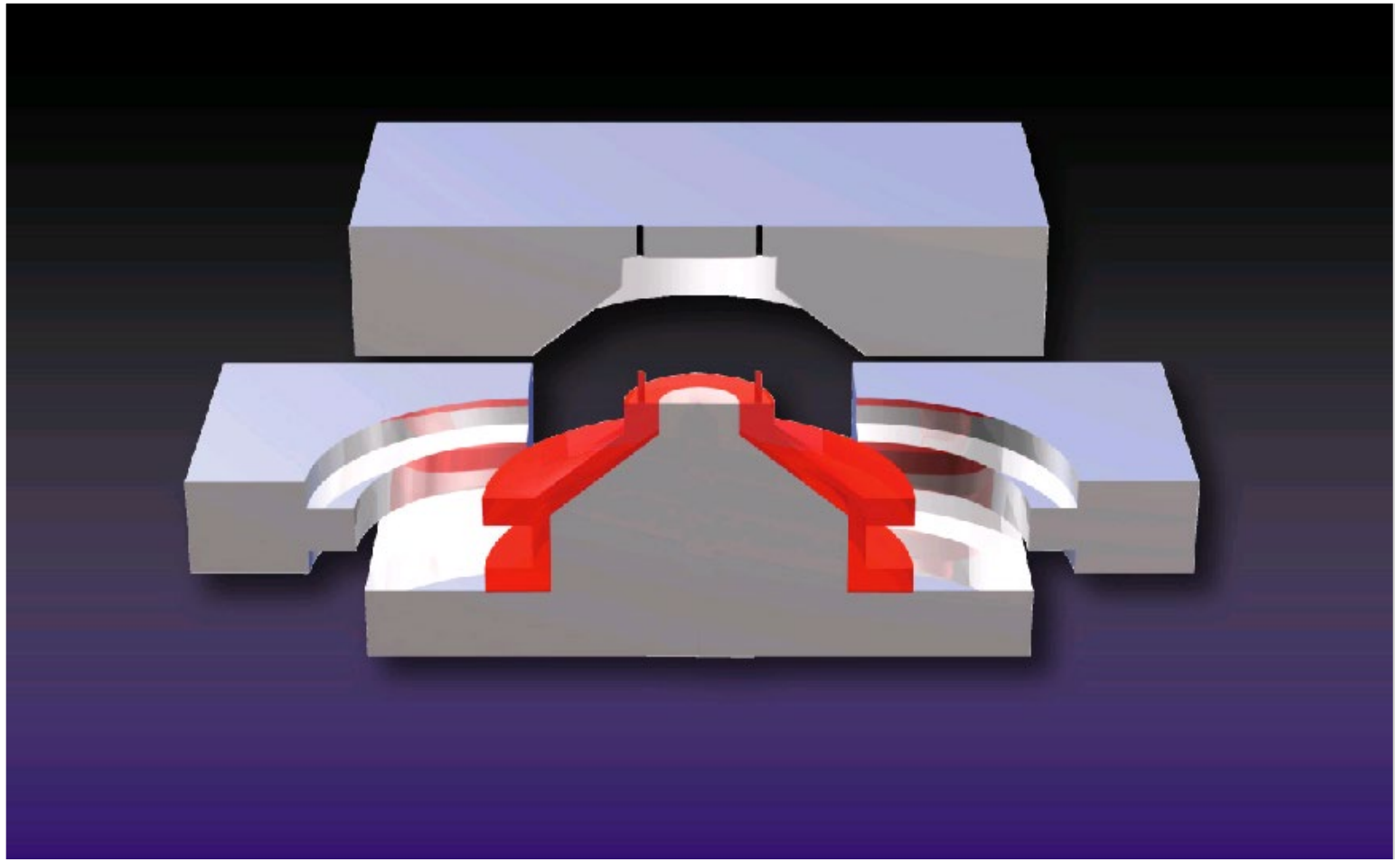




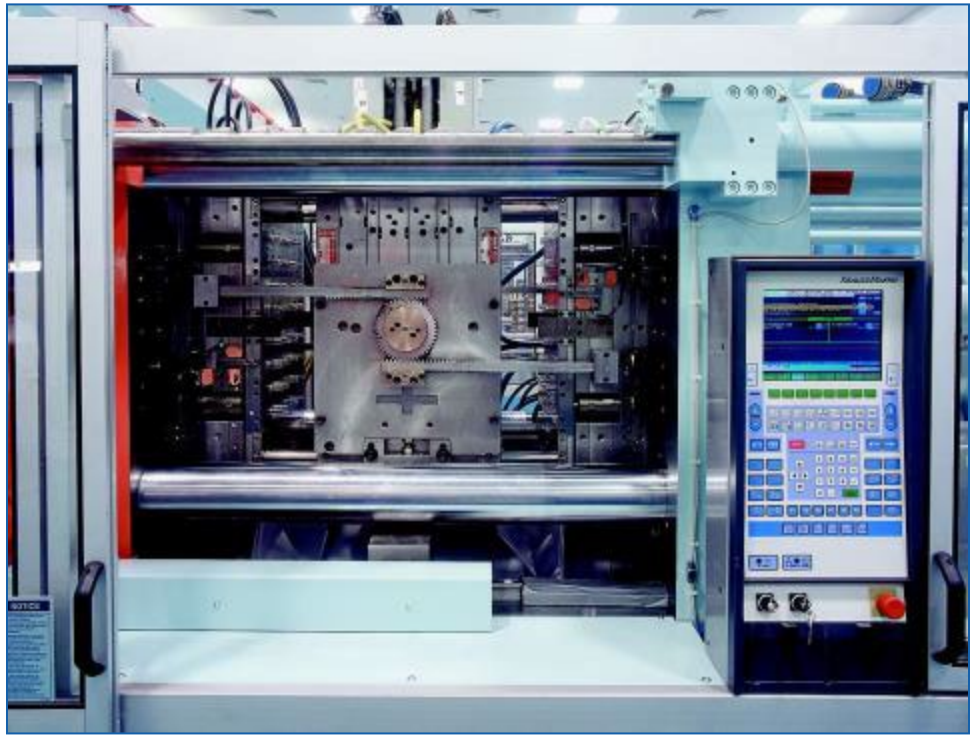
Expandable Cavity

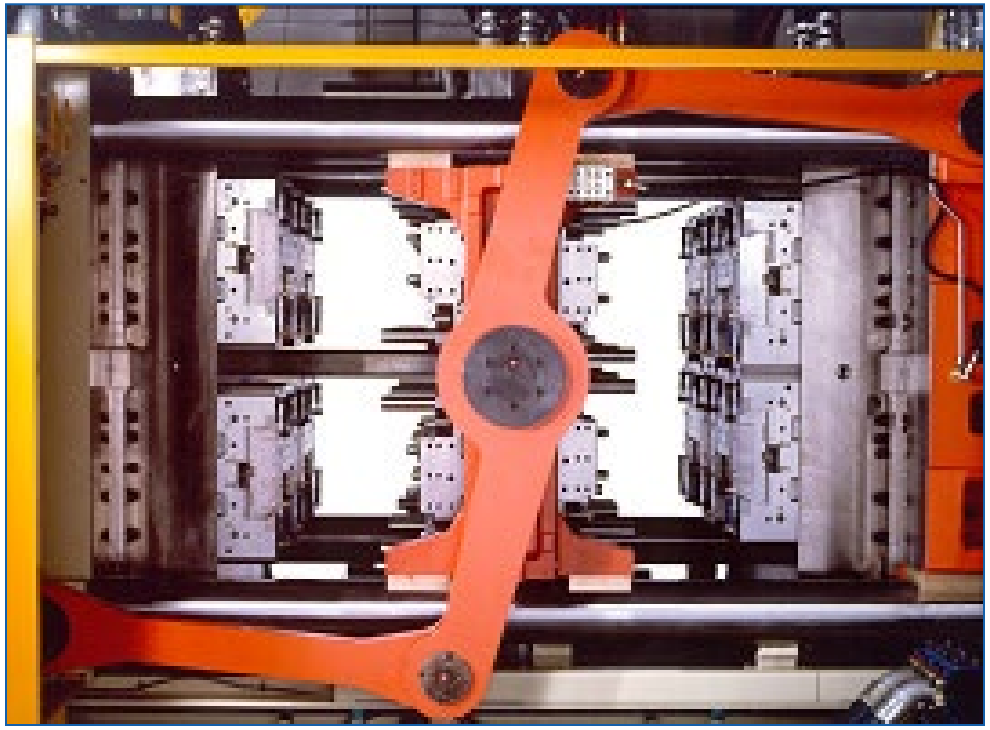


Cam Action



Stack Mold





Thank You

MRP solutions

Packaging with purpose.