



Division of Lindberg Corporation
Engineering Specifications

	400 ton Thixomolder®	600 ton Thixomolder®
Max Clamp Tonnage	400 ton	600 ton
Shot Capacity	3.5 pounds Mag.	9.0 pounds Mag.
Max. Part Projected Area	130 square inches	200 square inches
Between Tie Bars	24 inches	29 inches
Platen Size	42.75H x 39W	48 x 48
Die Thickness max/min	30/12 inches	36/14 inches
Die Stroke	15 inches	18 inches
Shot Positions	On center & 6in. below	On center & 6in. below
Hyd. bumper plate eject stroke	3 inches	5 inches
Hydraulic core slide equip.	yes	yes
Die Vacuum equip.	yes	yes
O.D. Die locating ring	5.497 inches	6.497 inches
Injection Nozzle Radius	1.00 inch Spherical	1.00 inch Spherical
DME Std. Sprue & Bushing Modified to THX Specs.	ZRB 8100 Large-Long ZRB 7100 Large-Short	ZRB 8100 Large-Long ZRB 7100 Large-Short

● Mechanical Properties	AZ-91-D	(Die Cast)
Ultimate Strength ksi/(Mpa)	33/ (230)	
Tensile Yield Strength ksi/(Mpa)	22/ (150)	
Elongation % in 2 in.(51mm)	3	
Compressive Yield Str.ksi/(Mpa)	24/ (165)	
Hardness, BHN 500kg. 10mm	63	
Shear Strength ksi/ (Mpa)	20/ (140)	
Impact Str. Unnotched ft#/(J)	2.7x10 ⁷ (2.0)	

83

ET01299

Confidential - Subject 5.22.0670000099 Order Williams V. Remington

Fatigue Strength (Mpa) 14 x10⁶ (97)
 Youngs Modulus psi x10⁶ (Gpa) 6.5 (45)

● Physical Properties	AZ-91-D (Die Cast)
Density lb/cu.in. (g/cc)	.066 (1.81)
Melting Range F° (C°)	875-1105 (470-595)
Specific Heat BTU/#° F (J/kg° C)	.25 (1050)
Coefficient of Thermal Expansion	
μ in/in.° C (μ m/m° K)	14 (26)
Thermal Conductivity	
BTU/ft hr ° F (W/m ° K)	41.8 (72)

Both Hot and Cold Chamber Die Cast tools can be easily converted to the Thixomolding® Process with the addition of a standard DME Sprue and Bushing.

● [Home Page](#) ●

● [What is Thixomolding®?](#) ● [What does a Thixomolder® look like?](#) ●

● [What is Thixotropic Semi-Solid Behavior?](#) ● [Advantages](#) ●

● [Engineering Specifications](#) ●

● [THX Molding Success Story](#) ● [Parts Produced](#) ●

● [Lindberg Corporation - Parent Company](#) ●

● [File Transfer](#) ●

● [Reps. Wanted](#) ●

For more information on THX Molding or the Thixomolding® process

Contact [Robert Kilbert](#)

THX
MOLDING

83

ET01300

Confidential - ~~Submittal~~ - 5.22.06r0000100 Order

Williams V. Remington

THIX MOLDING

Division of Lindberg Corporation

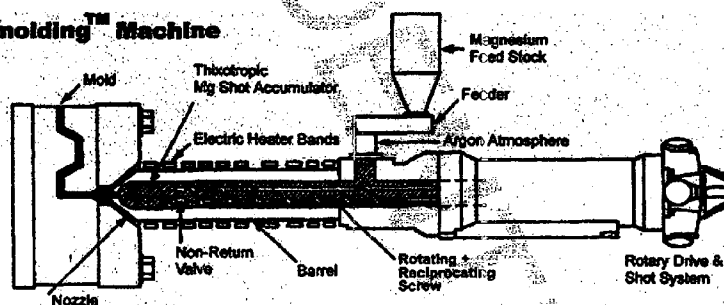
What is Thixomolding®?

In the conventional die casting process it is necessary to superheat the alloy to provide sufficient heat to retard the generation of dendrites and thus sufficient fluidity to fill the die.

In the Thixomolding® process it is required to heat the alloy only into the semi-solid temperature range, where through simultaneous application of shear and temperature the thixotropic structure is developed.

In contrast to the superheating required for die casting, Thixomolding® is carried out at a temperature more than 100 degrees Celsius cooler. The controlled viscosity permits easy and complete filling of the die.

Thixomolding™ Machine



How does Thixomolding® work?

Thixomolding® is accomplished in a unitary patented injection molding machine in a single step. Granular feed stock of commonly available alloys is fed into a heated temperature controlled barrel, advanced and at the same time thermo-mechanically conditioned by a screw converting the material to a thixotropic semi-solid state. It is then injected at high speed into a closed die to produce a solid part.

Thixomolding® is the only semi-solid process that uses conventional alloys not requiring a material that was converted into a thixotropic structure in a separate



Division of Lindberg Corporation

THX MOLDING SUCCESS STORY

TEXAS INSTRUMENTS DIGITAL LIGHT PROCESSING PROJECTION SYSTEM

THIXOMOLDED® STRUCTURAL COMPONENTS

THX Molding was recently awarded a contract to produce three Magnesium structural components for Texas Instruments' revolutionary new DIGITAL LIGHT PROCESSING PROJECTION SYSTEM. The new DLP™ systems are used to project computer images onto large projection screens using reflected light, producing extremely sharp and colorful images. Markets for these projectors are in business presentation projectors, home theaters, and movie house projection applications. The three structural Magnesium components produced via the Thixomolding® process at THX Molding have found their greatest application in the portable business presentation projector because of a 40% weight reduction by replacing a screwed together stamped steel frame system.

Engineers at Texas Instruments gave us the following input regarding the success of the program:

- THX Molding was able to meet Texas Instruments' demanding requirements for rapid mold production and production part deliveries only two weeks after mold completion.
- Dimensional repeatability was excellent with no assembly or functional problems attributed to part to part variation. All dimensions on the three Thixomolded® components were molded within NADCA Precision Tolerance requirements.
- These parts were a drop in replacement for a sheet metal design. This required thin wall, minimal draft, stiffness and emi shielding which could not be achieved in plastic.
- THX's ability to accurately mold in small pin and hole locating features to tight tolerances reduced part cost by eliminating separate hardware and installation as well as machining. Example: Two sets of .094 (+.0015 -.001) inch diameter cast locating pins spaced 7 inches apart were held within $\pm .002$. Two .100 diameter locating holes are cast within $\pm .001$ diametral tolerance.
- Assembly time was reduced over 50% because the Magnesium Thixomolding® design allowed implementation of DESIGN FOR ASSEMBLY which included more modular subassemblies and eliminated adjustments previously required.

Click on either picture for an enlarged view

23

Magnesium Assembly

3 Individual Parts

All tooling was built using electronic data transfer and solid model techniques. Final drawings were not available until well after the pre-production runs were complete. This design flexibility allowed TI the greatest latitude for design revision during tooling construction.

The entire program was completed on time allowing the customer to enter the market place in a position ahead of their competition. Not only was the program cycle time shortened, the component pricing was competitive with quotations from other major well established magnesium die casters.

LET THE REVOLUTIONARY NEW THIXOMOLDING® TECHNOLOGY BE A SUCCESS STORY FOR YOUR MAGNESIUM APPLICATIONS. THX MOLDING WAS THE FIRST COMPANY IN THE WORLD TO MASS PRODUCE THIXOMOLDED® COMPONENTS. WE HAVE SUCCESSFULLY MOLDED 72 PRODUCTION AND PROTOTYPE COMPONENTS AND CAN APPLY THIS EXPERIENCE TO YOUR APPLICATIONS.

For more information on Texas Instruments DLP™ products click [here](#)

ANOTHER THX MOLDING SUCCESS STORY

Lindberg Corporation purchased and installed the first 400 ton Thixomolder® in August of 1991. Over the next 2-1/2 years the Thixomolding® Process was developed to a point where in June of 1994 the machine was moved to a new Racine production facility and THX MOLDING was born. During the Development period, Lindberg produced over 52 prototype runs for customers in the Automotive, Computer/Electronics, Consumer products, Defense, Optical, and Telecommunications Industries.

THX MOLDING entered the Production Market by Producing 550,000 Magnesium Gear Case components for a major consumer products manufacturer over a one year period. The Thixomolding® Cell is Fully Automated (robotic extraction and die spray) and is operated by one person. The initial one shift operation was extended to two full production shifts with weekly JIT deliveries from 6,000 to 17,000 parts. The production die was a 4 cavity tool with a shot weight of 1.12 pounds and component weight of .21 pounds.

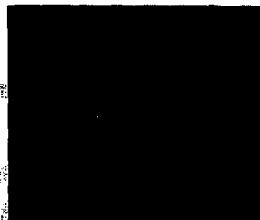
The Gear Case is truly a NET SHAPE part requiring no machining. A pin and bushing are simply pressed into the two bores and self tapping screws are used to assemble other components. Both of the bores are cast with ZERO DRAFT and controlled within $\pm .0005$ inch on the diameter. This part had also been produced using the same tool in the Hot Chamber die casting process. The customer stated that the overall quality and dimensional stability of the Thixomolded® parts was superior.

83

EFT01303

Confidential - Subject: 5.22.06r0000103e Order

Williams v. Remington



Magnesium Gear Case

[Click here for an enlarged view](#)

Lindberg Corporation increases Thixomolding® Production Capacity at its THX Molding Division

The THX Molding Division of Lindberg Corporation has purchased a second Magnesium Thixomolding® production cell. At the heart of this fully automated cell is a 600 ton (9 pound shot capacity) HPM Thixomolder®. The addition of this 600 ton cell to the existing 400 ton cell opens significant production capacity. The 600 ton production cell went online April 1997.

THX MOLDING IS SEEKING TO FILL OUR PRODUCTION CAPACITY.



600 TON Thixomolder® Cell

[Click here](#) for an enlarged view

● [Home Page](#) ●