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TIMEPLAST

RAW your comprehensive guide to understanding their features and applications.

NO.1

"NATURE TO BE COMMANDED,
MUST BE OBEYED."

Francis Bacon.

USER MANUAL

FEBRUARY,2024.

TIMEPLAST RAW

World's first time-programmable water-soluble material. One molecularly dynamic pelletized material capable of working in extrusion, injection molding, thermoforming and more processes. Simplifying circular economy while truly addressing planetary sustainability.

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Welcome to Timeplast

Congratulations on joining the Timeplast team! We extend our warmest greetings and sincere appreciation for choosing our pioneering material to be a part of your innovative projects. Your decision marks a significant step towards a future free from the environmental challenges posed by traditional plastics.

At Timeplast, we are not merely offering a material; we are presenting a vision of a world without microplastics—a dream to which you are now contributing. Your commitment to sustainability aligns seamlessly with our mission to redefine the landscape of plastic usage.

We express our heartfelt gratitude for deciding to work with Timeplast. By selecting our material, you are not only embracing a cutting-edge material but actively participating in the journey towards a greener, more sustainable future.

As you embark on this exciting venture, our dedicated support team is here to assist you at every step. Should you have any inquiries, require technical guidance, or simply wish to share your experiences, please feel free to reach out to us at info@timeplast.net.

Once again, welcome to Timeplast—where innovation meets sustainability, and dreams of a plastic-free world become reality. Thank you for being an integral part of our growing community.

Best Regards,
Timeplast Team

Introduction to Timeplast

Pioneering a plastic-free future
In a world grappling with the escalating crisis of plastic pollution, the urgency to seek innovative solutions has never been more apparent. Traditional plastics, with their enduring presence and adverse environmental impact, have fueled a global predicament that demands a transformative response. Current statistics on plastic pollution are alarming. The oceans are inundated with microplastics, landfills are reaching capacity, and ecosystems are under duress. The magnitude of this crisis demands a paradigm shift in the way we perceive and employ plastic materials.

What is Timeplast?
Timeplast, Inc. is a groundbreaking initiative committed to reshaping the narrative of plastic usage. At its core, Timeplast is not merely a product; it is a visionary approach to addressing the detrimental effects of plastics on our planet.
Timeplast resin is a revolutionary water-soluble biopolymer, an avant-garde alternative to traditional plastics. Derived from sustainable sources, it possesses the unique ability to dissolve harmlessly, mitigating the persistent pollution associated with conventional plastic waste.

Our Objective: A Plastic-Free Tomorrow
The primary goal of Timeplast is ambitious yet essential—to usher in a future devoid of microplastics. By introducing a material that offers the durability required for various applications while remaining environmentally responsible, Timeplast aims to set a new standard for sustainable manufacturing.

Product Range:
From extrusion, thermoforming, injection molding, 3D printing and others, Timeplast seamlessly integrates into diverse manufacturing processes. Our product range caters to multiple industries, providing a versatile solution for those seeking eco-friendly alternatives without compromising on performance. From single-use items to complex industrial components, our water-soluble biopolymer is making strides in reshaping how we perceive and utilize plastics.

Future of Timplast.
Positioned among the most promising players in today's burgeoning landscape of medium-sized technology enterprises, Timeplast envisions a future that transcends commercial success. In the years to come, we foresee ourselves not just as a standout company but as a global trailblazer leading the charge in replacing conventional plastics with environmentally sustainable alternatives. Timeplast is poised to be at the forefront of a paradigm shift, symbolizing a new vision of how technology can positively transform our lives.

Why Timeplast?

In the landscape of sustainable materials, Timeplast stands out as a groundbreaking innovation, redefining the paradigm of eco-friendly thermoplastics. It emerges as the first water-soluble thermoplastic with programmable hydroresistance, setting it apart from other alternatives in the market. This unique feature allows it to be both injection-molded and extruded, producing products with ample rigidity for everyday use.

What truly distinguishes Timeplast is its ability to decompose harmlessly when discarded, disappearing upon contact with water according to a predetermined hydro-solubility timeframe, ensuring minimal environmental impact. Originating from organic sources, Timeplast seamlessly integrates into plastic manufacturing processes. It avoids the generation of microplastics, offering various resin categories tailored for diverse market applications.

Timeplast outshines other materials in the current wave of green alternatives, sidestepping the need for specific conditions or prolonged periods for decomposition. Unlike many unproven contenders, Timeplast fulfills the criteria of a genuinely sustainable industry. From an environmental standpoint, it achieves the highest standard, being water-compatible, a substance covering 70% of our planet's surface. In essence, Timeplast is not just a material; it's a pioneering force driving sustainable practices forward.

Launching Timeplast Raw

As we embark on the initial phase of Timeplast's resin commercialization, our journey extends far beyond the mere introduction of a revolutionary material. This phase serves as a catalyst for global engagement and collaboration. Our primary objective is not only to showcase the unique capabilities of Timeplast but also to invite individuals and industries worldwide to explore its diverse commercial applications. This marks a pivotal moment, as anyone with an interest can now actively participate in testing and incorporating Timeplast into their projects.

The commercialization phase is not just about the present; it's a strategic step towards securing the resources needed to propel Timeplast into new frontiers. The proceeds generated will fuel the development of advanced resin categories, innovative engineering applications, and general-use products crafted with Timeplast. This financial support is instrumental in expanding our research and development endeavors, ensuring that Timeplast continues to evolve and meet the ever-growing demands of sustainable manufacturing.

Moreover, this phase signifies our commitment to global growth. We envision Timeplast not merely as a product but as a global movement, influencing industries and practices across borders. By fostering partnerships, embracing technological advancements, and staying attuned to the needs of a changing world, we position Timeplast at the forefront of the sustainable materials landscape.

Important considerations

Timeplast Raw is an experimental material that is continuously evolving.

It is made available to the public to gather comments and feedback.

Timeplast is a trial material designed to initiate projects and explore areas for improvement.

Timeplast Raw is not a conventional plastic and requires a different treatment as per the provided guidelines.

Timeplast represents a new type of material with ongoing developmental processes.

Avoid prolonged exposure to high temperatures, as Timeplast can burn. Keep temperatures low and refrain from leaving the material in the machine for an extended period.

Timeplast has not been certified for food contact. The user is responsible for obtaining the necessary authorizations and certifications.

Success depends on adherence to instructions and the level of engineering applied. **Timeplast, Inc. does not assume responsibility for specific outcomes or inconveniences.**

Experiment responsibly with Timeplast; please carefully read the instructions in this manual before use.

THE PRODUCT

The purpose of this manual is to provide a comprehensive guide on the utilization of Timeplast Raw, which is available in the form of pellets, packaged in 50lb bags of Timeplast raw material, in its natural color. This material has been specifically engineered to serve as a testing element in various manufacturing processes, including extrusion, injection molding, blow molding, thermoforming, expansion, 3D printing, and other relevant methods within the industry.

The versatility of Timeplast resin makes it an exceptional resource for crafting environmentally sustainable aplications and water-soluble products. Below, detailed instructions are provided to fully harness the unique properties of Timeplast resin across different industrial applications.

Due to its noble nature, in contrast to conventional plastic, Timeplast Raw displays heightened sensitivity to temperature, necessitating increased attention during the production process. In general terms, it is a homogeneous blend of various materials of natural origin, such as solid-state alcohols, cellulose, vinegar, among others. The material's properties result in a stable mixture among these components, yet undergo dynamic changes throughout the production process. This phenomenon is attributed to the material's polymerization as it progresses through the process.

Handling and storage

Distinctively engineered with organic components, this material demonstrates a minimal impact on living organisms, emphasizing its commitment to sustainability. Boasting low levels of adverse effects, Timeplast offers a benign alternative.

Despite its organic nature, Timeplast's co-polymer composition, featuring cellulose and alcohol, exhibits remarkable stability, assuring reliability in various use cases.

Storage conditions mirror those of conventional plastics, with a preference for avoiding extreme environments. Following these guidelines, we outline **the ideal conditions for working with Timeplast**:

Personal Protective Equipment (PPE): Utilize splash-resistant safety goggles and chemical-resistant gloves (neoprene recommended). Wear appropriate clothing to prevent skin exposure.

Ventilation: Employ Timeplast outdoors or in well-ventilated areas. Implement local ventilation systems or enclosures for indoor use.

Slippery Surfaces: Exercise caution around slippery surfaces created by spilled polymer solutions. Take precautions to prevent falls.

Skin and Eye Contact: In case of contact, wash thoroughly with soap and water. Seek medical advice if irritation persists.

Packaging: Securely pack Timeplast to prevent spills during transport. Adhere to regulatory guidelines for transporting water-soluble polymers.

Avoid High-Pressure Water Streams: Do not disperse spilled material with high-pressure water streams during transport.

Emergency Equipment: Ensure carriers are equipped with emergency eye wash stations and quick-rinse showers.

Fire Safety: While Timeplast does not burn in solution, exercise caution regarding flammable materials in the vicinity during transport.

Temperature: Store Timeplast at room temperature, protecting it from freezing. Ensure storage conditions align with classification criteria.

Original Packaging: Preserve the material in its original container to maintain integrity.

Incompatible Materials: Avoid storage near oxidizing agents, acids, peroxides, perchlorates, nitrates, or reactive metals.

Environmental Precautions: Comply with measures to prevent environmental discharge as per regulations.

Always refer to the Safety Data Sheet (SDS) included in this manual for detailed information and adhere to local, regional, and international regulations.

Resin categories overview

Timeplast has developed various types of resin with modifications in their characteristics, aimed at adapting to various applications in the industry. As the creator of this innovative material, Timeplast, Inc. possesses the necessary technology to continue improving the resin. Among these advancements, Timeplast has achieved programmable hydrosolubility, allowing the delivery of highly hydrosoluble resin, with delayed hydrosolubility, or very low hydrosolubility.

This is because some uses of plastic require contact with water, while others do not or only occasionally. However, resins with lower hydrosolubility will need extended exposure to water to fully decompose. In general terms, Timeplast applications will break down in the presence of water over scales of days, months, or years.

Next, we present the three available categories of Timeplast resin:

Timeplast Active

Timeplast Active
Characterized by its remarkable water solubility and flexibility, accompanied by excellent flow and molding capabilities. Once this material comes into contact with water, a decomposition reaction is triggered, causing utensils made with this resin to disintegrate in a matter of days in the presence of the liquid. This resin is particularly recommended for applications involving disposable items or those that will not have contact with water.

Water Decomposition Scale: Days
Environment Decomposition Scale: Months

Timeplast Extended

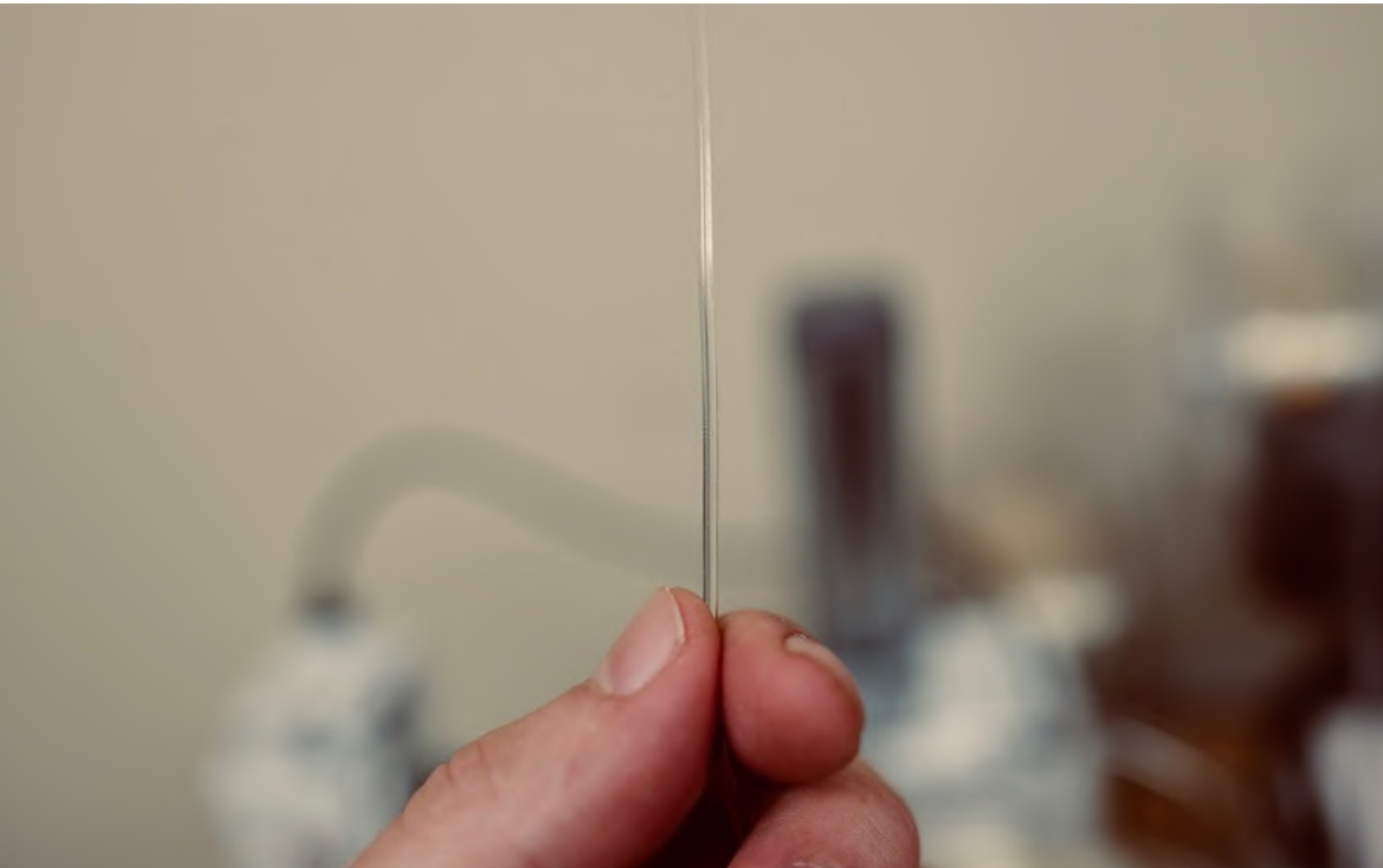
This resin represents the ideal fusion of Active and Passive Timeplast resins, offering a medium to high level of flow and flexibility. Upon contact with water, a slight reaction of the material may be observed without affecting its functionality. Utensils made with this resin require months in the presence of water to decompose. It is recommended for the production of common items intended for medium-term use, especially those exposed to humidity or occasional water contact.

Water Decomposition Scale: Months
Environment Decomposition Scale: Years

Timeplast Passive

Timeplast Passive
This resin features low water solubility, a moderate level of flow, and flexibility. Its reaction when exposed to water is minimal, and utensils made with this material require years in the presence of water to decompose. This resin is recommended for the manufacturing of utensils that will be in constant contact with water or have long-term usage.

Water Decomposition Scale: Years
Environment Decomposition Scale: Permanent



Discrepancies in the production process

Timeplast stands out significantly from conventional plastics. Deviating from the traditional polymeric chain, this material is classified as an entirely organic thermoplastic, showcasing distinct characteristics and behaviors compared to what is commonly observed in plastic manufacturing.

Unlike conventional plastics, whose properties undergo minimal changes during thermoforming, the physical characteristics of Timeplast will vary based on the variables applied to it. This dynamic behavior underscores the importance of comprehending and controlling each stage of the process to ensure consistent and satisfactory outcomes.

Here are some key variations to consider when working with Timeplast:

• **Sensitivity to Heat/Time Matrix:** Unlike conventional plastic, Timeplast is responsive to applied heat on the material, providing it with a maximum energy absorption capacity. Prolonged exposure to high temperatures can volatilize or burn certain components of the material, darkening its color and releasing gas as it approaches the temperature limit.
• **Continuous Flow Maintenance:** Users are urged to keep the material flowing continuously within the machine. Halting the process and leaving Timeplast inside may cause it to burn, thereby losing its properties. During this process, the material may change color, turning green or yellow, and emitting gas as it nears the temperature limit.

• **Polymerization During Shaping:** Polymerization of the material occurs during the shaping process, resulting in expected changes in molecular weight and final product properties.

• **Fluency Index Variation:** The material's flow capacity varies with temperature, requiring consideration and control for desired outcomes.
• **Pressure and Flexibility:** Higher pressure in the production process can generate increased flexibility in the final product.
• **Constant Expansion and Mechanical Rigidity:** Under certain conditions, subjecting the material to a constant expansion process will yield a final product with greater mechanical rigidity.

These variations underscore the importance of understanding and controlling process conditions to ensure optimal results and preserve the unique properties of Timeplast material.

Other Considerations:

The recommendations and guidelines provided in this manual are based on tests conducted in laboratory and field environments with the material. However, the material's performance during the process may vary depending on the forming method, type of machinery, product geometry, environmental conditions, and the specific type of resin being evaluated.

As the material's main characteristic is its water solubility, which increases with supplied temperature, it is not recommended to cool the material or product with water, as this could initiate the decomposition process.

Preparation

Due to its natural and organic origin, Timeplast cannot be mixed with polymers, additives, colorants, catalysts, or other fossil-based elements, as it would lose all its environmental benefits. Only additives of proven organic origin with verified environmental neutrality, such as inputs from the food industry like dyes, fragrances, natural oils, and natural minerals that can enhance its physical properties, can be incorporated.

After unpacking, it is crucial to avoid the Timeplast material coming into contact with water or being exposed for extended periods in highly humid environments. Conducting preheating for drying can be considered a beneficial practice, as Timeplast includes inactive water elements in its composition. However, it is not a mandatory requirement for production.

Timeplast can be pre-mixed, but exceeding the exposure time to temperature should be avoided due to its energy absorption limit. For the same reason, it should be incorporated into the process immediately once the material reaches the desired physical properties and characteristics.

During a material change, Timeplast can be mixed with other polymers while cleaning the screw, or vice versa. However, it is important to note that there is low electrostatic compatibility between Timeplast and fossil-based polymers, resulting in a low level of adhesion between them.

Different Timeplast resins may emit odors, so conducting tests, especially in applications involving aromatic products, is ideal. These can be incorporated following the instructions provided earlier.

Operating parameters

Based on the results obtained from studies and initial production tests, we present the recommended basic operation data for using Timeplast Raw. These parameters are defined within broad ranges to allow you to seek the optimal processing conditions for your machinery. Therefore, it is imperative to conduct preliminary tests before the start of production to adjust and fine-tune them appropriately.

Below is a guideline framework of temperatures that will enable you to carry out the tests, along with detailed instructions by process type described in the next chapter.

Extrusion or Injection Screw:

Minimum working temperature: 150 °C

Working range: 170 °C – 197 °C

Maximum working temperature: 215 °C

Film Sealing:

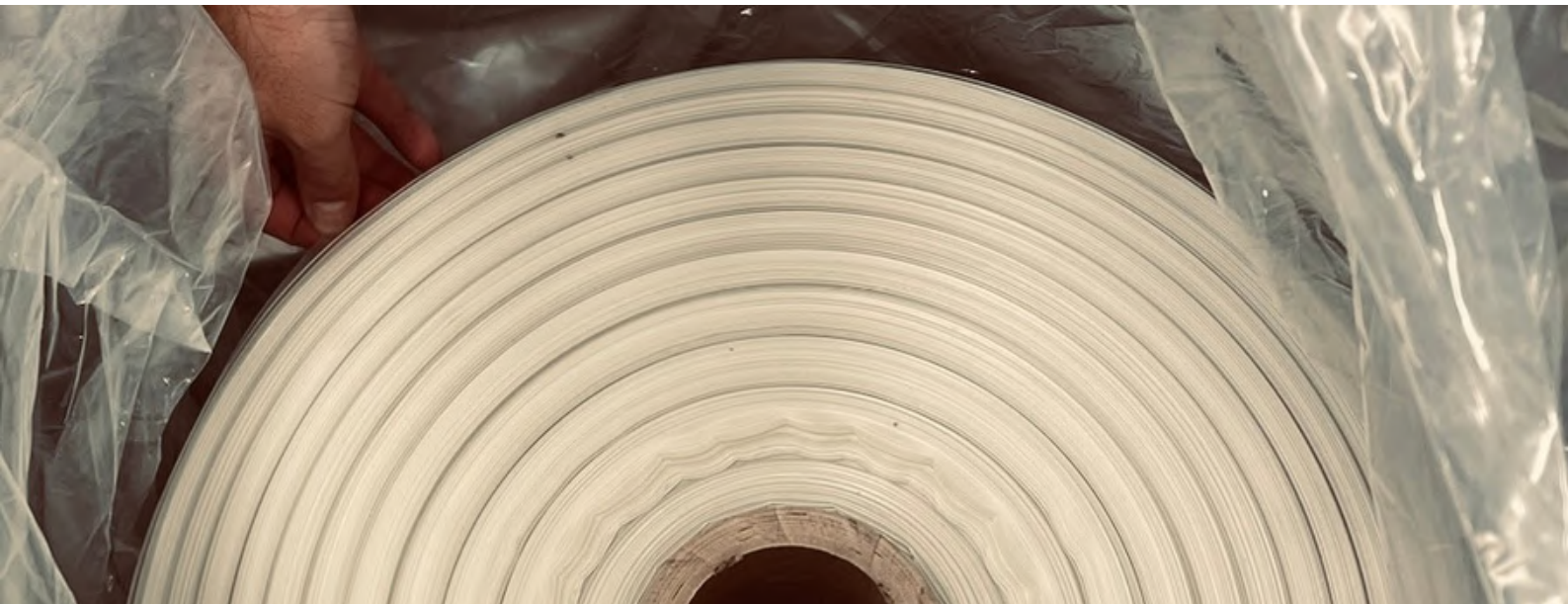
Temperature range: 220 °C - 260 °C

Sheet Thermoforming:

Temperature range: 250 °C - 450 °C

It is essential to note that these parameters are preliminary and subject to variations. Various factors, such as the dynamic molecular weight of Timeplast, which varies during the polymerization process, and the enthalpy supplied to the material, can influence these variations. Additionally, the unique geometry of each machine and product may introduce variations in the required thermal matrix.

Furthermore, the possibility of variations in temperature readers in the plant should be considered, whether due to calibration issues or being subject to the specific environmental conditions of the production environment.



Production processes guidance

Preliminary Note:

Considering the unique properties of Timeplast compared to traditional materials, it is crucial to embrace an open mindset towards new approaches. Previous experience with conventional plastics may not be entirely applicable in this context.

Thermal Indicator of the Material: Color

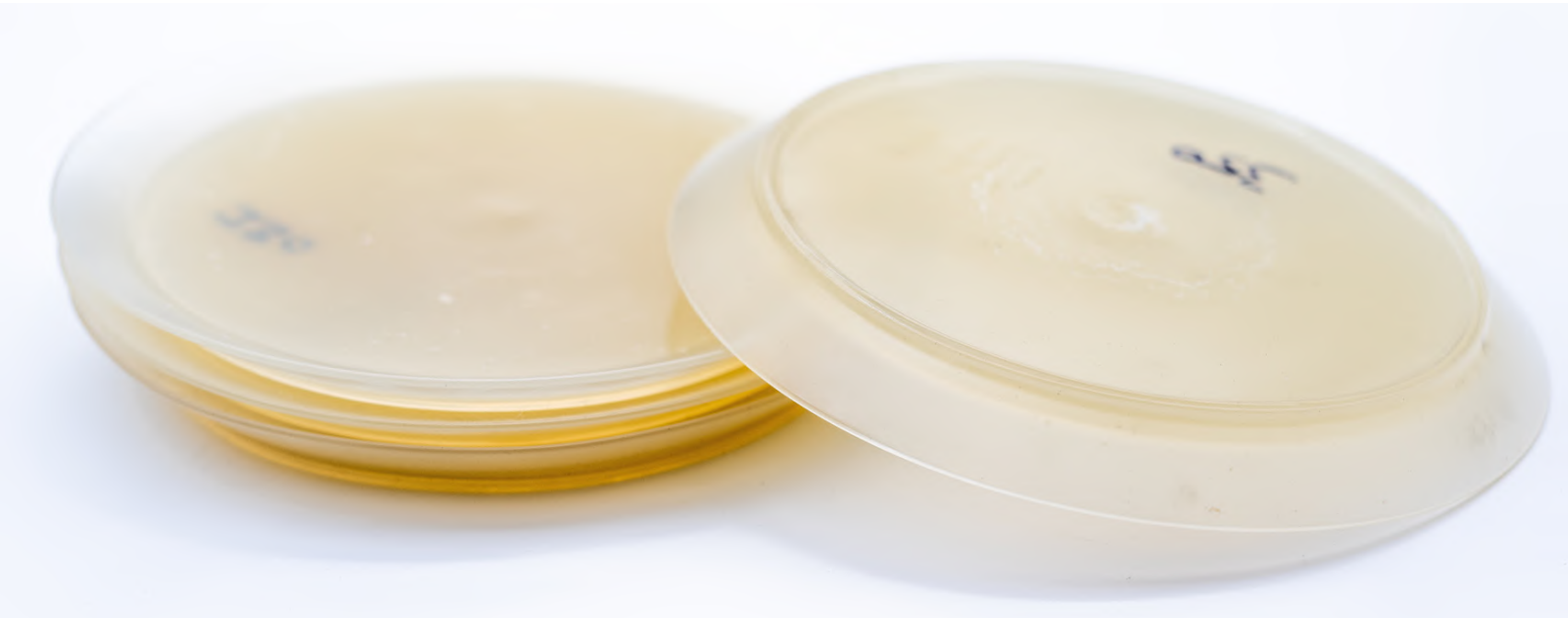
During the production process, you will notice that as the temperature of the material increases, it undergoes changes in its physical properties, including fluidity and natural color (pearl or cream).

Color is the most reliable indicator of the optimal working temperature. Timeplast will change its hue to yellow or light green if it approaches its thermal limit. At this point, it is crucial to halt any further temperature increase and revert, as its components, such as alcohols and cellulose, could begin to combust, emitting vapors with a characteristic odor similar to burnt sugar or vegetal matter.

Throughout the process, it is essential to stabilize the temperature before reaching this critical point, as it can jeopardize the material and the characteristics of the final product.

You must maintain constant vigilance over the color while adjusting the temperature, avoiding reaching the thermal limit. Overall, the goal is to keep the color as close as possible to its original hue.

Below are some examples of the colors that Timeplast can acquire:



OPTIMAL MATERIAL



Recommended working range.
Original color of the material remains unchanged.
No vapor emission.
The crystalline condition of the material remains intact.
Basic fluidity.

MATERIAL AT THE LIMIT



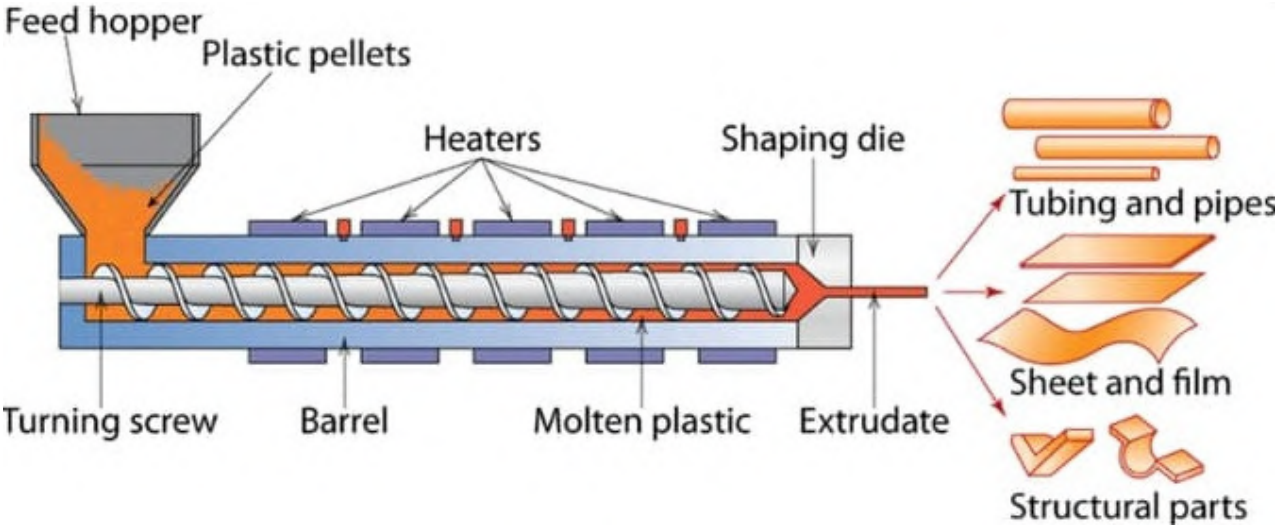
- Increased fluidity, but compromise of the material's components.
- Vapor emission at low to medium levels.

BURNT MATERIAL



- Thermal limit exceeded.
- Burnt material with high vapor emission.
- Appearance of alcohol oils.
- Risk of machine channel obstruction.

Extrusion



To optimize the extrusion process with Timeplast, it is recommended to follow these steps:

1. Initial Preparation:

If you are going to perform purging with Timeplast

- Start with a clean screw or after passing a low-melting-point material to prevent contamination.
- Put prime Timeplast into the clean screw.
- Begin the process below 180 °C and gradually increase the temperature to achieve the desired fluidity.
- Ensure the material exhibits an "ivory" or "light green" hue at the nozzle exit, indicating readiness. Do not exceed 200 °C as this could damage the material.

If you are going to perform purging with conventional material

- If transitioning from conventional plastic to Timeplast, maintain the previous temperature and purge with Timeplast Raw.
- Put Timeplast to mix with the conventional plastic.
- Start reducing the temperature gradually as Timeplast enters the machine.
- Note that due to the sensitivity and lower melting point of Timeplast, initial darkening and vaporization of Timeplast Raw may occur.
- The first extruded material may need to be discarded, and continue reducing the temperature for Timeplast to regain its original color.

2. Explore Timeplast Working Range:

- Adjust the temperature, extrusion speed, and pressure as needed and evaluate properties such as fluidity and desired color until achieving a balance that stabilizes production.
- Take note of the specific parameters of your extrusion machine.

3. Initiate Product Manufacturing and Sample Evaluation:

- Once the process is optimized, begin manufacturing the product and collect samples for evaluation.
- Make final adjustments according to desired standards.
- If seeking greater fluidity and nearing the material's temperature limit, experiment with increasing pressure to achieve the desired results.

Extrusion Success Stories

Testing parameters

Nozzle	Screw 4	Screw 3	Screw 2	Screw 1	Throat	-
160C	160C	150C	150C	120C	60C	-

Nozzle	Screw 4	Screw 3	Screw 2	Screw 1	Throat	-
190	170	170	170	165	150	-

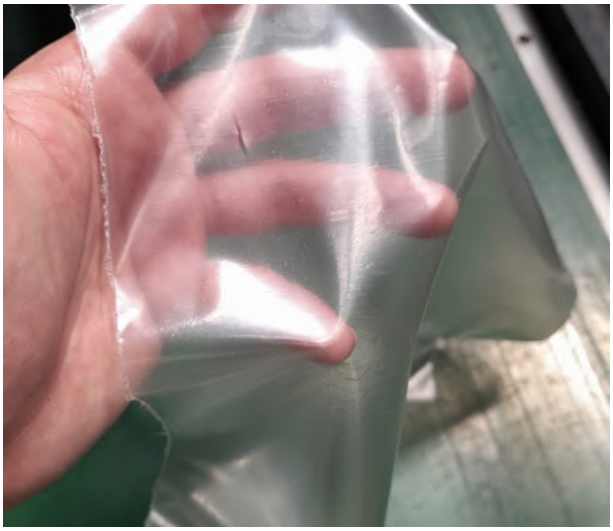
Nozzle	Screw 4	Screw 3	Screw 2	Screw 1	Throat	-
190	185	185	180	180	170	-

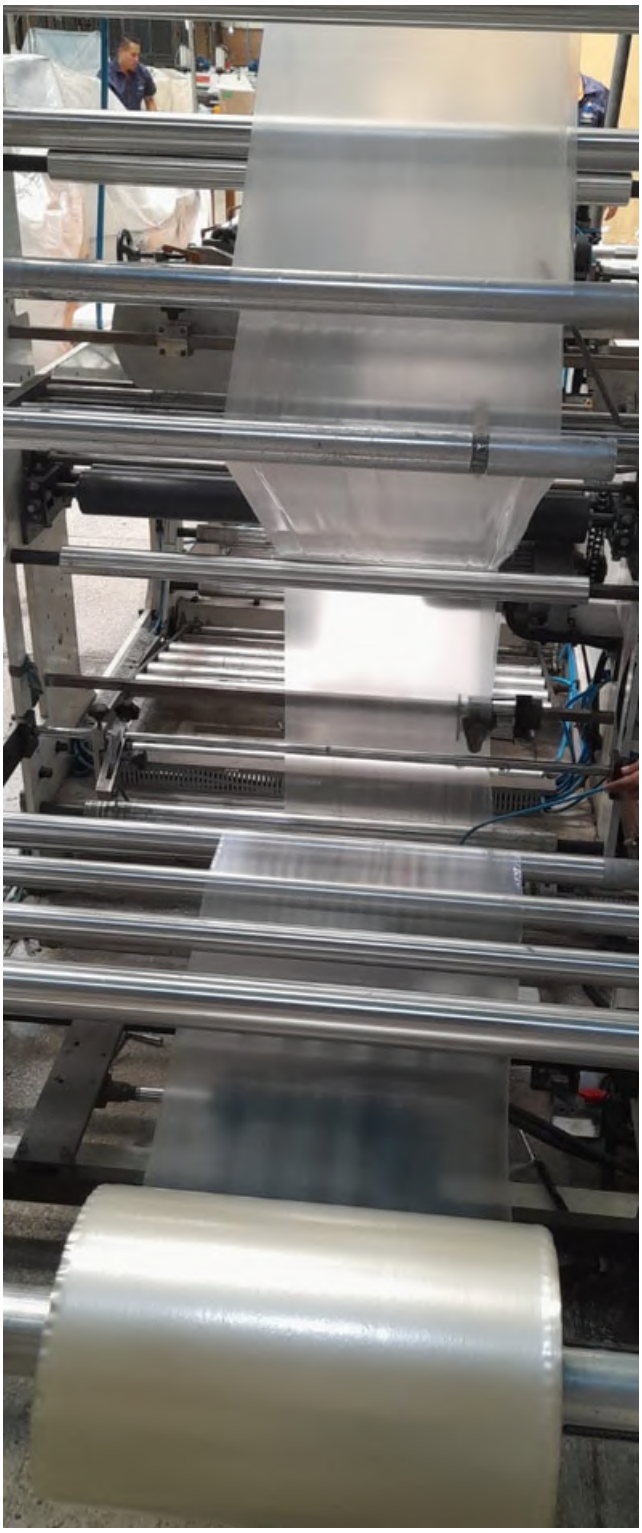
Nozzle	Screw 4	Screw 3	Screw 2	Screw 1	Throat	Speed
189	-	-	-	185	193	45rpm

Testing parameters Extrusion Blow-molding

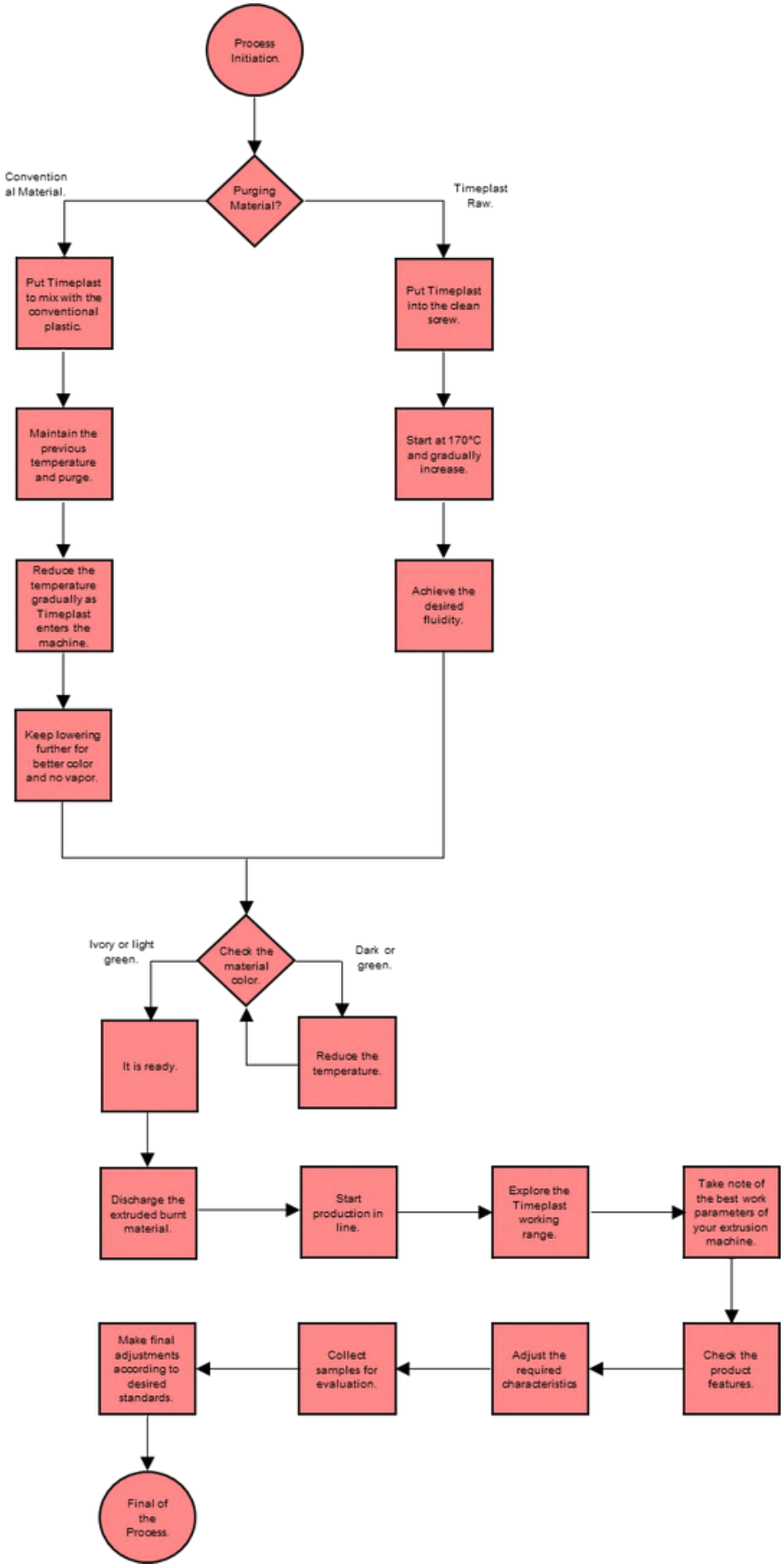
Blowing	Screw 3	Screw 2	Screw 1	AirFlow	Sealing
197	170	154	170	23.92m3/h	240

Blowing	Screw 3	Screw 2	Screw 1
198.89	198.89	198.89	198.89



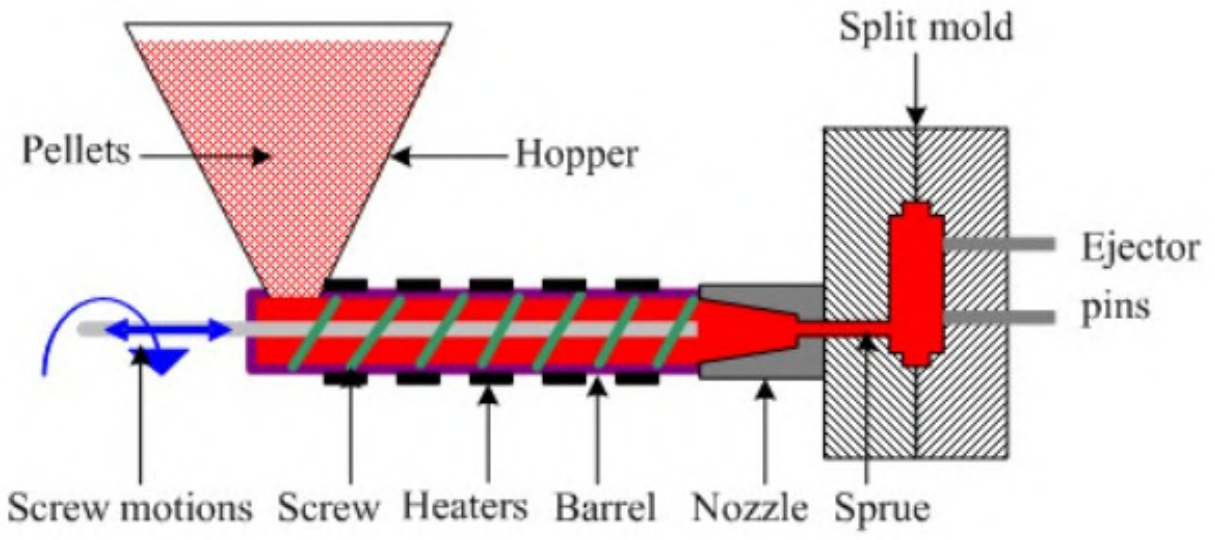


Extrusion Flowchart



Injection

1.Preparation:
Follow the instructions outlined in the previous Extrusion chapter for the pre-melting stage of the material in the screw.



2. Temperature Adjustment:
Ensure that the Timeplast material reaches the appropriate temperature within the operating range of 170-200 °C.

3. Material Injection:
Proceed with material injection into the mold cavity.

4. Evaluate Mold Filling:
- Thoroughly evaluate mold filling to ensure proper distribution of the material.
- Adjust the pressure gradually and maintain it between 70 MPa (10,000 psi) and 200 MPa (30,000 psi).

5. Address Filling Issues:
- If mold filling issues persist, consider increasing the temperature by ten degrees to improve flow, up to a maximum of 220 °C (430 °F).
- Exercise caution when making temperature adjustments to avoid resin component volatilization and material damage.

Explore alternative solutions such as adjusting injection speed and pressure within the specified range, switching to a more fluid resin like Active or Extended, or enlarging mold filling channels to enhance flow and prevent abrupt pressure increases.

6. Continuous Process Operation:

- Keep the injection molding process running continuously to minimize the risk of volatilization due to Timeplast's thermosensitivity and lower energy absorption capacity compared to traditional plastics.
- Sample Collection and Evaluation:
- Collect samples during injection molding operations.
- Evaluate the characteristics of the samples to determine if they meet the desired standards.

7. Process Adjustment:

- Adjust process variables as needed based on sample evaluation to achieve desired product specifications.
- Stabilization and Record-Keeping:
- Once the process is stable, record the specific parameters of your injection molding machine for future reference.

8. Mass Production:
Proceed with mass production once the process has been optimized and parameters are well-documented.

Injection Success Stories

Testing parameters

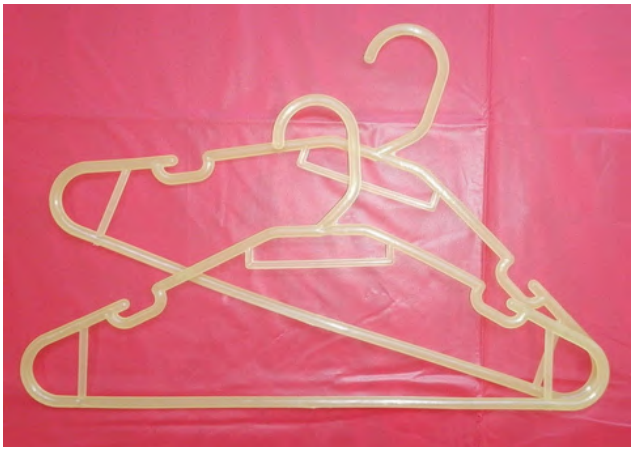
Nozzle	Screw 4	Screw 3	Screw 2	Screw 1	Pressure
205.7	197.5	196.5	190.2	184.7	120MPa
205.1	200.5	199.6	192.6	185.1	

Nozzle	Screw 4	Screw 3	Screw 2	Screw 1	Throat	Pressure
239.5	238.9	243.4	235.8	234.2	225.0	77.15Mpa

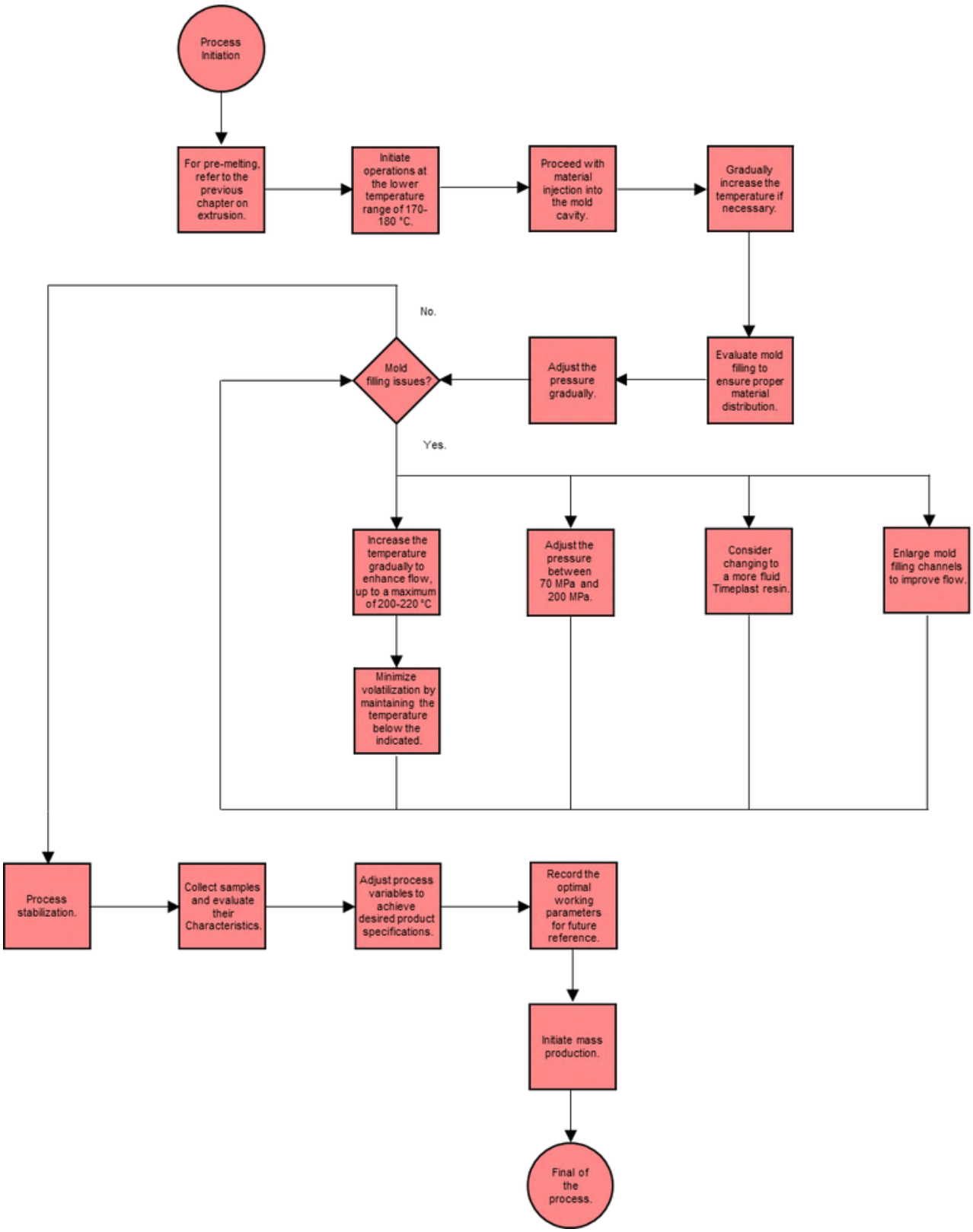
Nozzle	T2	T1	Pressure 1	Pressure 2
205	200	195	160MPa	165MPa


TIMEPLAST
RETHINKING PLASTIC
ACTIVE

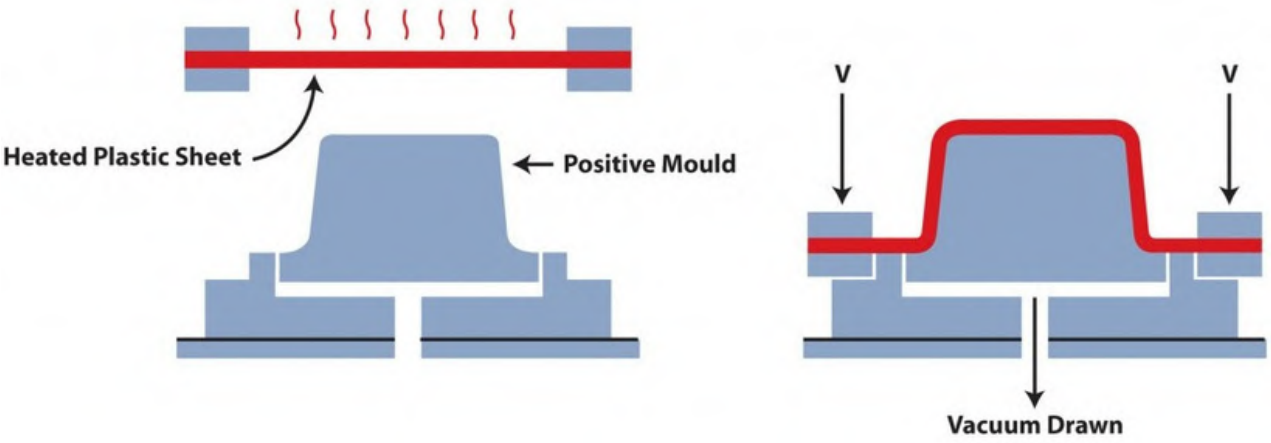

TIMEPLAST
TIME-PROGRAMMABLE MATTER



Injection Flowchart



Thermoforming



1. Preparation:
Install a roll of Timeplast sheet onto the machinery, ensuring it is properly aligned and secured.

2. Temperature and Pressure Adjustment:
Set the average temperature in the molds to a minimum of 250 °C (392 °F) and adjust the pressure to a minimum of 100 psi.

3. Initiate Stamping:
Start the stamping process and closely monitor its performance.

4. Temperature Increment:
Gradually increase the temperature in 20 °C increments as the run progresses until reaching a balanced process.

5. Pressure Adjustment:
Make necessary adjustments to the pressure to optimize mold filling and material distribution.

6. Temperature Control:
Maintain control over the temperature to prevent material burning or vaporization, which can lead to excessive gas emissions.

7. Gas Composition Monitoring:
Understand that any gas emissions during the process are harmless and composed of water vapors, vinegar, and alcohol sugars, all of which are natural components of Timeplast.

8. Temperature Range Exploration:
Explore the temperature range of 250 to 450 °C (482-482 °F) to observe material behaviors and identify optimal working parameters.

9. Record Keeping:
Record the optimal working parameters for your machine, including temperature, pressure, and any other relevant settings.

10. Monitoring Thermal Limit:
Stay vigilant about Timeplast's thermal limit; if there are any changes in color or gas emissions, consider halting or reducing the temperature increase.

11. Mass Production Initiation:
Once the process is stabilized, initiate mass production while continuing to monitor performance.

12. Sample Collection and Evaluation:
Collect samples of the final product and evaluate their characteristics, including structural integrity and surface finish.

13. Geometry Experimentation:
Experiment with various geometries to understand potential variations in working parameters and product outcomes.

14. Cutting System Troubleshooting:
If issues arise with the cutting system, consider upgrading to a more efficient blade or exploring alternative solutions.

15. Exploration of Alternative Categories:
Explore other categories of Timeplast Raw as potential alternatives to address any challenges encountered during the testing process.

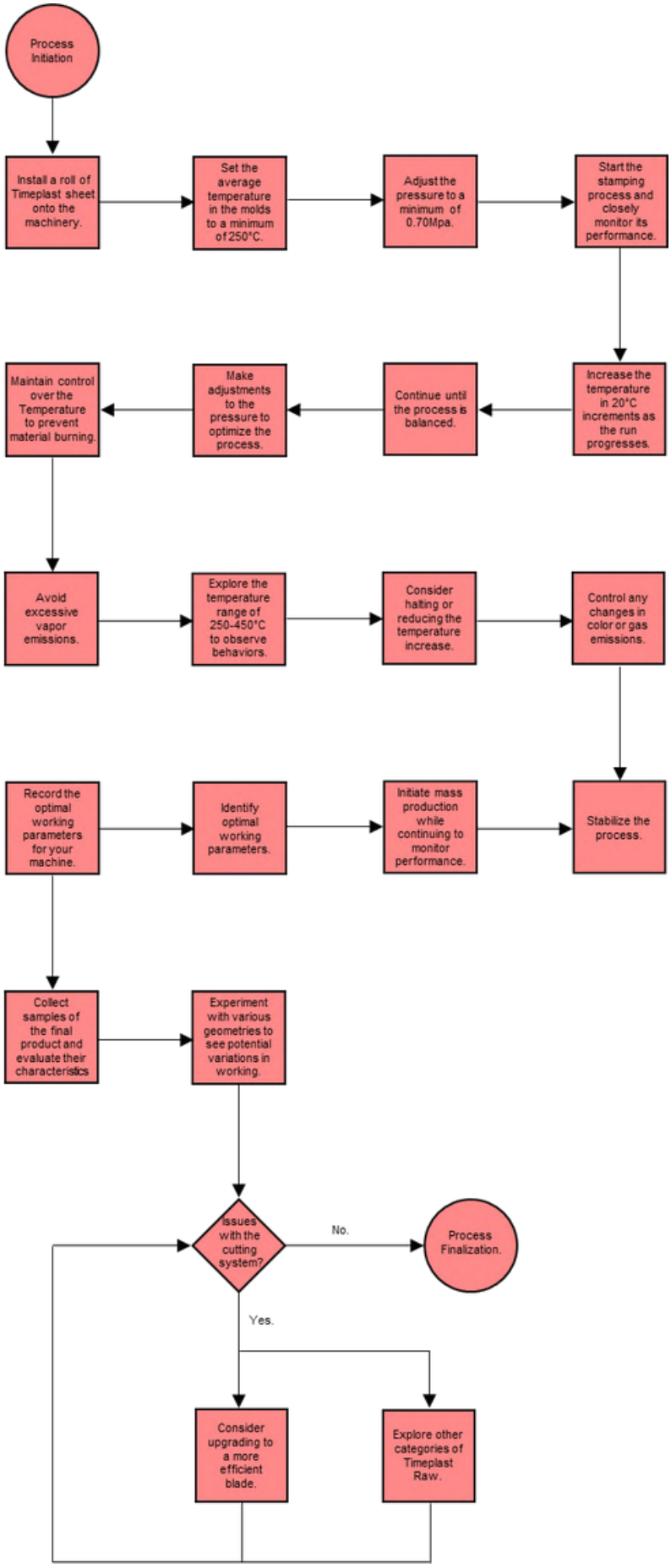
Thermoforming Success Stories

Testing parameters

Cups Machine			Pressure: 100Psi		
Mold 1	**Mold 2**	**Mold 3**	**Mold 4**	**Mold 5**	**Mold 6**
358C	349C	368C	378C	369C	355C

Container Machine					Pressure: 200Psi		
Mold 1	**Mold 2**	**Mold 3**	**Mold 4**	**Mold 5**	**Mold 6**	**Mold 7**	**Mold 8**
445.8C	432.9C	416.4C	424.5C	455.4C	436.8C	446.8C	457.1C
Mold 9	**Mold 10**	**Mold 11**	**Mold 12**	**Mold 13**	**Mold 14**	**Mold 15**	**Mold 16**
330.3C	299.5C	270.5C	294.2C	325.6C	267.9C	282.7C	394.1C

Thermoforming Flowchart



3D printing

This manual synthesizes insights from comprehensive testing on 3D printers, focusing on achieving the highest print quality with Timeplast, which can be flexible. The guidance provided here is based on extensive experimentation using Orcaslicer and Bambu Studio on Bambu Lab X1-Carbon and Bambu Lab P1P printers. Our goal is to help users navigate the challenges of printing with Timeplast filament to prevent issues such as clogging and stringing.

Understanding Material Challenges

Flexible filaments, particularly those with high melting points like Timeplast, present unique challenges in 3D printing. Timeplast can be difficult for consumer-grade 3Dprinters to handle due to the printers' inability to sufficiently heat the filament before extrusion. This inadequacy leads to slow extrusion rates and can cause the nozzle to clog. A potential solution involves pre-heating the filament to a temperature just below its melting point to facilitate smoother extrusion. However, this approach introduces concerns regarding filament softness and cooling during transit from the spool to the nozzle. Having said that; It is not required to preheat in order to have successful printings.

Equipment and Settings in our studies.

- **Printer Models:** Bambu Lab X1-Carbon and Bambu Lab P1P.
- **Nozzle Sizes:** Testing was conducted with 0.6mm and 0.4mm nozzles. The 0.4mm nozzle demonstrated superior performance in terms of print quality and speed, particularly with flexible filaments.
- **Build Plate:** Cool Plate/Smooth PEI, with a bed temperature of 35°C.
- **Nozzle Temperatures:** 200°C for the 0.6mm nozzle and 200°C for the 0.4mm nozzle.
- **Print Profiles:** A standard process print profile of 0.24mm was used for the 0.6mm nozzle, and 0.20mm for the 0.4mm nozzle.
- **Flow Ratio and Max Volumetric Speed:** A flow ratio of 0.95 and 1 for the respective nozzles, with a max volumetric speed of 20 mm^3/s for the 0.4mm nozzle.
- **Additional Requirements:** Glue may be necessary for build plate adhesion in both scenarios.

Key Observations and Solutions

1. **Filament Pre-Heating:** Consider the possibility of pre-heating the filament to address extrusion issues. However, be mindful of the challenges regarding cooling in the Bowden/PTFE tubing and potential softness at higher temperatures.
2. **Nozzle Size and Quality:** The 0.4mm nozzle emerged as the preferred choice, balancing speed and print clarity.
3. ** Water vapor.** Since Timeplast is mostly water, noticeable water vapor release and residue buildup were observed, particularly during pre-print purges. While easily cleaned, this could deter some users. Ensuring proper ventilation and regular maintenance can mitigate these issues.
4. **Stringing and Diameter Consistency:** Addressing filament stringing and diameter inconsistencies is crucial. Monitoring filament diameter during the filament's extrusion can prevent clogs and under-extrusion. Using modern printers with dynamic flow compensation can help tremendously.

3D Printing Success Stories

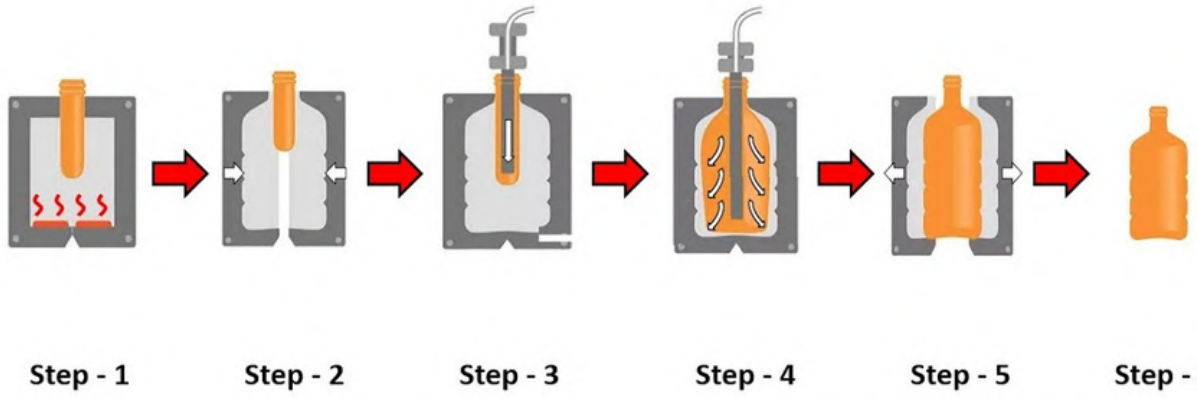
Injection-Blow Molding

1. Preparation:
Ensure the injection-blow molding machine is properly set up for Timeplast Raw material processing.

2. Temperature Adjustment:
Set the temperature within the recommended range of 160 to 215°C to optimize working parameters.

3. Material Injection:
Inject the Timeplast Raw material into the mold cavity.

4. Evaluate Mold Filling:
Thoroughly assess mold filling to ensure uniform distribution of the material within the mold.



5. Address Liquid Compatibility:
Confirm that the intended product does not contain water-based liquids, as Timeplast Raw is not suitable for such applications due to water solubility.

6. Explore Suitable Applications:
Identify potential applications for Timeplast Raw, focusing on bottling non-polar liquids like oils that are insoluble in water.

7. Quality Assessment:
Evaluate the quality of the resulting parts, considering factors such as surface finish, dimensional accuracy, and structural integrity.

8. Process Stabilization:
Achieve process stabilization by balancing various variables including pressure, speed, and mold and part geometry.

9. Swelling Capacity Consideration:
Recognize that the swelling capacity of Timeplast Raw is lower than that of conventional plastics, which may impact mold design and part dimensions.

10. Documentation and Record-Keeping:
Document the specific parameters used during the injection-blow molding process with Timeplast Raw for future reference and optimization.

11. Iterative Improvement:
Continuously refine the injection-blow molding process with Timeplast Raw based on observed results and feedback, aiming for increased efficiency and quality.

Frequently Asked Questions

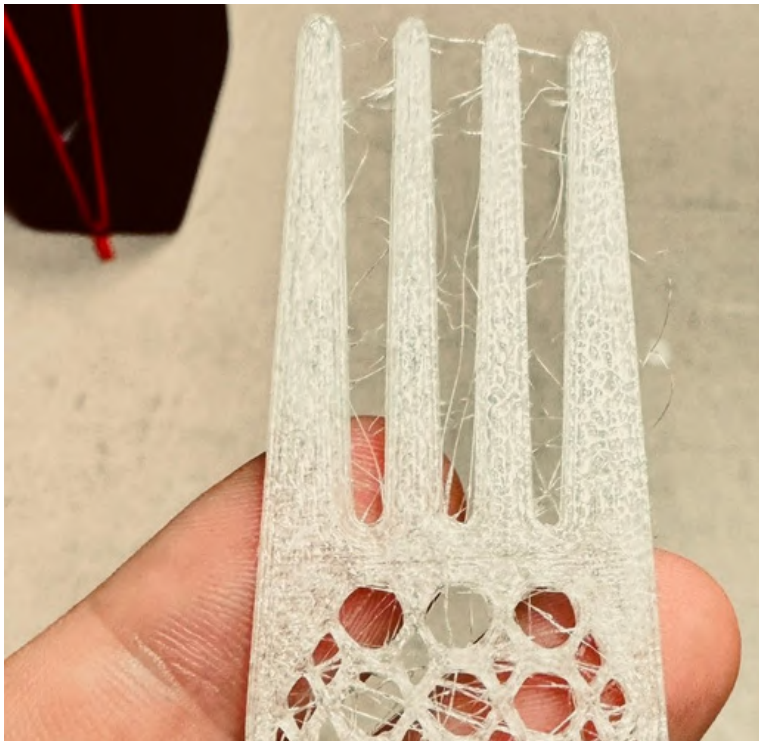
Can Timeplast be stored in humid environments?
As long as it remains within its original packaging, it can be stored in humid places; however, it is recommended for use once removed from the package.

Can I incorporate masterbatch into the mix?
Timeplast requires any additive incorporated into the material to be of natural origin and environmentally neutral. The use of additives from the food industry is recommended.

Why does the material emit a gas or smelly vapor when melting?
It is normal but indicates that the material is near its temperature limit. Please reduce the temperature until the gas emission stops.

Is there any risk associated with the gas emitted by Timeplast?
Since Timeplast is an organic material, and the gas released is primarily composed of water vapor, vinegar, and alcohol sugars, it poses no significant health or environmental risks.

If the final product is too flexible, how to solve it?
You can choose to use another category of resin with less flexibility, such as Extended or Passive, or increase the thickness of the piece.



What to do if Timeplast does not flow or flows at a very low rate?
Carefully increase the temperature; alternatively, increase the pressure.

If the product comes out dark or strangely oily from the machine, what does it mean?
Timeplast is burning. Immediately reduce the temperature and increase the flow rate to remove the damaged material.

Even after raising the temperature, Timeplast does not flow enough, what should I do?
Consider using another category of resin that is more flexible, such as Extended or Active.

How can images and letters be printed on the final product?
Printing solutions for this new material are under development. Clients can innovate in this field using inks of natural origin and environmentally neutral, such as those from the food industry.

If the product changes shape immediately upon contact with water or liquid, how to avoid it?
You can use a resin category that is less water-soluble, such as Extended or Passive, or increase the thickness of the piece to improve resistance.

I am using Active, the most flexible resin, but Timeplast does not flow enough or triggers the machine's high-pressure warning. How to resolve it?
Expand the mold's filling channels to improve the flow and avoid a sudden pressure increase (injection solution).

How to avoid the generation of bubbles in the product or material?
Conduct a pre-drying; water particles may be present in the material.

Can Timeplast be stored in sunny places?
No, Timeplast should be stored in a ventilated and shaded space.

CONTACT INFO

Customer Support - North America:
info@timeplast.net

Other Locations Support:

Europe:
ivan.presa@timeplast.net

Latin America:
jose.rodriguez@timeplast.net

Colombia:
teofilo.sanchez@timeplast.net

India:
sundar.baskaran@timeplast.net

Disclaimer

All information provided, including product characteristics, applications, and properties, is intended for reference purposes only and should not be interpreted as specifications. Prior to using this product, customers are advised to diligently adhere to the instructions provided by a Timeplast team member. This is essential to determine the most suitable version of this resin for manufacturing the specific product and to ascertain its appropriateness for the customer's intended purpose.

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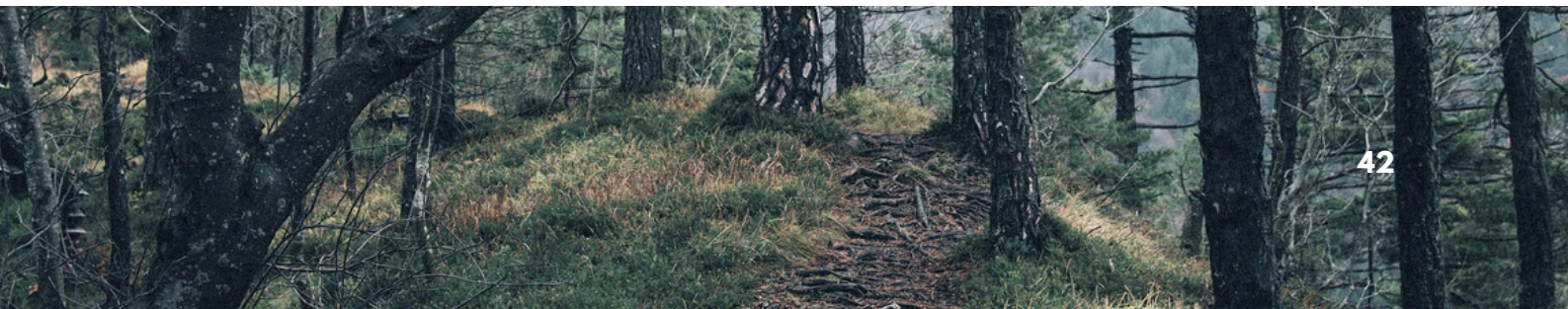


TECHNICAL DATA SHEET

Technical Data Sheet

Product Type: Alcohol-based thermoplastic programmable material

TIMEPLAST

PRODUCT DESCRIPTION

Timeplast is a specially designed hydrosoluble alcohol-based copolymer that features programmable water immunity, stiffness, flowability and balanced mechanical properties for a low molecular weight material. Timeplast complies with FDA requirements in the code of Federal Regulations in 21 CFR 177.1520 for food contact. This product complies with ASTM E1148-02, a water solubility test, the highest environmental standard for any material.

CHARACTERISTICS

Typical Application:

Bio-based resin substitute for typical fossil-based polymers used in extrusion, thermoforming, or injection molding of single use plastic products.

FEATURES

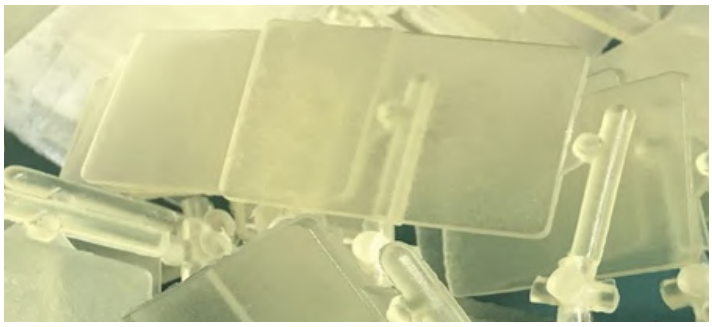
Flexibility – Stiffness – Flowability – Balanced mechanical properties

Typical properties:

Melt Index (145°C, 1kg) = 8-25g/10min
Density = 0.8g/ml
Tensile Strength at Yield = 150 Kg/cm2
Flexural Modulus = 10000 Kg/cm2
Notched Izod Impact Strength (23°C) = 3 Kg.cm/cm

STORAGE & HANDLING

This product should be stored in dry condition at temperature below 40°C and protected from UV-light. When condensation is visible or can be expected, pre-drying is recommended. (Drying condition: 80~100°C/2~4hours at air circulated condition).



MOLDING PROCEDURES

1. Prepare the injection molding machine by purging it with virgin polypropylene completely until clean and empty.

2. Set the temperatures for running the Timeplast water soluble resin:

a. Feed throat and first heater zone - **140 degrees C.**

b. Second, middle, and front screw (barrel zone) - **150 degrees C.**

c. Third heating zone (nozzle zone) - **155 degrees C.**

3. Prime the machine with the Timeplast resin just before running parts.

4. It is expected that parts will be strong and may display a yellowish tint with minor splay marks.

a. Coloring can be added, as long as it's a water soluble color with no polymeric carriers or masterbatch, preferably liquid color.

5. It is important to purge the machine after running the product with virgin polypropylene.

SAFETY DATA SHEET

TIMEPLAST

ALCOHOL-BASED WATER SOLUBLE THERMOPLASTIC

Section 1 - PRODUCT AND COMPANY IDENTIFICATION

SDS ID: TPLST0021

Material Name

Timeplast. Alcohol based co-polymer.

Trade Names

The following specific grades are covered by this SDS: Timeplast for injection molding, thermoforming and extrusion.

Synonyms

Water soluble thermoplastic material.

Chemical Family

Cellulose and alcohol co-polymer.

Product Use

Packaging materials, rigid and flexible.

Restrictions on Use
None known.

Details of the supplier of the safety data sheet

Timeplast INC

1844 LONGWOOD LAKE MARY RD, LONGWOOD, FLORIDA

Emergency Phone Numbers:
In USA: TIMEPLAST 305-801-0043
www.timeplast.net

Section 2 - HAZARDS IDENTIFICATION

Classification under Regulation (EC) No 1272/2008.

Skin Sensitization - Category 1A & 1B

GHS Label Elements Symbol(s)

GHS Label Symbol

Signal Word

Warning

Hazard Statement(s)

H317: May cause an allergic skin reaction.

Precautionary Statement(s) Prevention

P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
P272: Contaminated work clothing must not be allowed out of the workplace. Wear protective gloves.

Response

P302 + P350: IF ON SKIN: Wash with plenty of soap and water.
P333 + P313: If skin irritation or rash occurs: Get medical advice/attention.
P363: Wash contaminated clothing before reuse.
P321: Specific treatment (see label).

Storage

None needed according to classification criteria.

Disposal

P501: Dispose of contents/container in accordance with local/regional/national/international regulations.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

Component Name	CAS	Classification	Percent (%)
Water	7732-18-5	Not Classified	70.0-95.0
PVA, Cellulose, vinegar, Timeplast proprietary alcohols	25213-24-5	Skin Sens. 1: H317	5.0-30.0
Sodium	127-09-3	Not Classified	0.01-0.1
acetate Methyl acetate	79-20-9	Flam. Liq. 2; H225, Eye Irrit. 2; H319, STOTSE 3; H336	0.001-0.1
Ethyl alcohol / Methyl alcohol (non measurable at less than 0.001%)	64-17-5	Flam. Liq. 2; H225	0.1
5-Chloro-2-methyl-3(2H)-isothiazolone, mixture with 2-methyl-3(2H)-isothiazolone	55965-84-9	Acute Tox. 4 : H302, Skin Sens. 1: H317	0.0038

Section 4 - FIRST AID MEASURES

Description of Necessary Measures

Wash thoroughly after handling.

Inhalation

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/ physician if you feel unwell.

Skin

Wash with plenty of soap and water. If skin irritation or rash occurs, seek medical advice/attention. Wash contaminated clothing before reuse.

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Ingestion

If a large amount is swallowed, get medical attention.

Most Important Symptoms/Effects Acute

May cause an allergic skin reaction. **Delayed**

May cause an allergic skin reaction.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically and supportively.

Note to Physicians

Treat symptomatically and supportively.

Section 5 - FIRE FIGHTING MEASURES

Extinguishing Media
Suitable Extinguishing Media
The product itself does not burn in solution. Dry polymer: Use dry chemical, carbon dioxide, alcohol-resistant foam or water spray.
Unsuitable Extinguishing Media
Do not scatter spilled material with high-pressure water streams.
Special Hazards Arising from the Chemical
carbon monoxide, carbon dioxide.
Fire Fighting Measures

Keep unnecessary people away, isolate hazard area and deny entry. Do not enter confined spaces unless adequately

ventilated. Cool containers with water spray until well after the fire is out. Keep away from heat, sparks and flame.
Special Protective Equipment and Precautions for Firefighters
Wear full protective fire fighting gear including self contained breathing apparatus (SCBA) for protection against possible exposure.

Section 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment and Emergency Procedures

Keep unnecessary people away, isolate hazard area and deny entry. The mixture is slippery when wet. Avoid contact with skin and eyes.
Methods and Materials for Containment and Cleaning Up
Use approved industrial vacuum cleaner for removal. Absorb spillage to prevent material damage. Collect in closed and suitable containers for disposal.

Environmental Precautions

Prevent environmental discharge consistent with regulatory
requirements.

Section 7 - HANDLING AND STORAGE

Precautions for Safe Handling

Use only outdoors or in a well-ventilated area. Spilled polymer solution is very slippery. Use care to avoid falls. Wash thoroughly after handling.
Conditions for Safe Storage, Including any Incompatibilities
None needed according to classification criteria.

Protect from freezing. Store at room temperature. Store in original container.

Incompatible Materials

Oxidizing agents, acids, peroxides, perchlorates, nitrates, reactive
metals.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EU - Occupational Exposure (98/24/EC) - Binding Biological Limit Values and Health Surveillance Measures

There are no biological limit values for any of this product's components.

ACGIH - Threshold Limit Values - Biological Exposure Indices (BEI)
Methyl alcohol (67-56-1)
15 mg/L Medium: urine Time: end of shift Parameter: Methanol (background, nonspecific)

Engineering Controls

Provide local exhaust or process enclosure ventilation system.

Individual Protection Measures, such as Personal Protective Equipment Eye/face protection

Wear splash resistant safety goggles. Contact lenses should not be worn.

Skin Protection

Wear appropriate clothing for plastic manufacturing.

Respiratory Protection

A NIOSH approved air-purifying respirator with an appropriate cartridge or canister may be appropriate under certain circumstances where airborne concentrations are expected to exceed exposure limits.

Glove Recommendations

Wearar appropriate chemical resistant gloves.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Characteristic	Description
Appearance	Pellets
Odor	Sugary/vinegary
Melting Point	170 C
Boiling Point Range	200-260 C
Autoignition Temperature	Non-flammable
Physical State	Solid
Color	Lightly Golden
Molecular Weight	20,000 - 200,000 g/mol
Decomposition temperature	240 C

Physical and chemical properties

Section 10 - STABILITY AND REACTIVITY

Reactivity

No hazard expected.

Chemical Stability

Stable under normal conditions of use.

Possibility of Hazardous Reactions

Hazardous polymerization will not occur.

Conditions to Avoid

Protect from freezing.

Incompatible Materials

Oxidizing agents, acids, peroxides, perchlorates, nitrates, reactive metals. Hazardous decomposition products

oxides of carbon.

Section 11 - TOXICOLOGICAL INFORMATION

Information on Likely Routes of Exposure Inhalation
No information on significant adverse effects. **Skin Contact**

May cause slight irritation. May cause an allergic skin reaction.

Eye Contact

May cause slight irritation. viscous polymer solution.

Ingestion

May cause gastrointestinal irritation.

SDS ID: SSC10004

Section 11 - TOXICOLOGICAL INFORMATION

Acute and Chronic Toxicity
Component Analysis - LD50/LC50
The components of this material have been reviewed in various sources and the following selected endpoints are published:
Water (7732-18-5)
Oral LD50 Rat >90 mL/kg
PVA (25213-24-5)
Oral LD50 Rat 3530 mg/kg
Dermal LD50 Rabbit >10 g/kg
Inhalation LC50 Rat >30 g/m3 1 h
Methyl acetate (79-20-9)
Oral LD50 Rat >5 g/kg
Dermal LD50 Rabbit >5 g/kg
Inhalation LC50 Rat 16000 ppm 4 h

Ethyl Alcohol
Oral LD50 Rat 6200 mg/kg
Inhalation LC50 Rat 22500 ppm 8 h

5-Chloro-2-methyl-3(2H)-isothiazolone, mixture with 2-methyl-3(2H)-isothiazolone (55965-84-9)
Oral LD50 Rat 53 mg/kg
Product Toxicity Data
Acute Toxicity Estimate

Dermal	>2000 mg/kg
Oral	>2000 mg/kg

Immediate Effects

May cause an allergic skin reaction.

Delayed Effects

May cause an allergic skin reaction.

Irritation/Corrosivity Data

No information on significant adverse effects.

Respiratory Sensitization

No data available.

Dermal Sensitization

May cause an allergic skin reaction.

Component Carcinogenicity

None of this product's components are listed by ACGIH, IARC, NTP, DFG or OSHA

Germ Cell Mutagenicity

Ames test found to be negative. No hazard expected.

Tumorigenic Data

No data available

Reproductive Toxicity

No data available.

Specific Target Organ Toxicity - Single Exposure

No target organs identified.

Specific Target Organ Toxicity - Repeated Exposure

No target organs identified.

Aspiration hazard

No data available.

Medical Conditions Aggravated by Exposure

eye disorders, gastrointestinal
disorders

Section 12 - ECOLOGICAL INFORMATION

Component Analysis - Aquatic Toxicity

Acetic acid ethenyl ester, polymer with ethenol	**25213-24-5**
Fish:	LC50 96 hr Lepomis macrochirus (Bluegill sunfish) 10 g/L; LC50 96 hr Pimephales promelas (Fathead minnow) 40 g/L
Invertebrate:	EC50 48 hr Daphnia magna 8300 mg/L
Sodium acetate	**127-09-3**
Invertebrate:	EC50 48 h Daphnia magna >1000 mg/L IUCLID
Methyl acetate	**79-20-9**
Fish:	LC50 96 h Pimephales promelas 295 - 348 mg/L [flow-through]; LC50 96 h Brachydanio rerio 250 - 350 mg/L [static]
Algae:	EC50 72 h Desmodesmus subspicatus >120 mg/L IUCLID
Invertebrate:	EC50 48 h Daphnia magna 1026.7 mg/L IUCLID

Aquatic Toxicity in fish: LC50 96 h Pimephales promelas 28200 mg/L [flow-through]; LC50 96 h Pimephales promelas >100 mg/L [static]; LC50 96 h Oncorhynchus mykiss 19500 - 20700 mg/L [flow-through]; LC50 96 h Oncorhynchus mykiss 18 - 20 mL/L [static]; LC50 96 h Lepomis macrochirus 13500 - 17600 mg/L [flow-through]

Bioaccumulative Potential

Low.

Biodegradation

99.9%

Chemical Oxygen Demand (COD)

Ca. 17000 mgO2/g

Section 13 - DISPOSAL CONSIDERATIONS

Dispose of contents/container in accordance with local/regional/national/international regulations.

Component Waste Numbers

The U.S. EPA has not published waste numbers for this product's components

Section 14 - TRANSPORT INFORMATION

US DOT Information: UN/NA #: Not Regulated

TDG Information: UN#: Not Regulated

Section 15 - REGULATORY INFORMATION

U.S. Federal Regulations

This product can be used in compliance with the following FDA regulations:

21 CFR 175.105 Adhesives

21 CFR 175.300 Resinous and polymeric coatings

21 CFR 175.320 Resinous and polymeric coatings for polyolefin films. Restricted minimum viscosity at 4% (20C) 4 cP

21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods. Restricted minimum viscosity at 4% (20C) 4 cP

21 CFR 176.180 Components of paper and paperboard in contact with dry food

21 CFR 177.1200 Cellophane Restricted minimum viscosity at 4% (20C) 4 cP

21 CFR 177.1670 Polyvinyl alcohol film Restricted minimum viscosity at 4% (20C) 4 cP

21 CFR 177.2260 Filters, resin-bonded

21 CFR 177.2800 Textiles and textiles fibers

21 CFR 178.3910 Surface lubricants used in the manufacture of metallic articles

The product may be used in compliance with 21 CFR 175.320 as a dispersing agent at levels not to exceed 6% of the coating weight in coatings for polyolefin films. The finished film may contact only low-moisture fats and oils and dry solids [foods of the types V, VIII, and IX - Table 1, 21 CFR 176.170(c)].

The product may also be used in compliance with 21 CFR 177.1670 in contact with foods of the types V, VIII, and IX - Table 1, 21CFR176.170(c). The finished food contact film may not be used as a component of food container intended for use in contact with water.

All of the above clearances are subject to the end-use and extractive limitations cited in the specific regulations.

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

Methyl alcohol	67-56-1
SARA 313:	1 % de minimis concentration
CERCLA:	5000 lb final RQ ; 2270 kg final RQ

SARA Section 311/312 (40 CFR 370 Subparts B and C)
A**cute Health:** Yes **Chronic Health:** No **Fire:** No **Pressure:** No **Reactivity:** No.
U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA
Methyl acetate	79-20-9	Yes	Yes	Yes	Yes	Yes
Methyl alcohol	67-56-1	Yes	Yes	Yes	Yes	Yes

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects

Methyl alcohol 67-56-1

Repro/Dev. Tox developmental toxicity, 3/16/2012

Section 16 - OTHER INFORMATION

HMIS Rating

Health: 0 Fire: 1 Reactivity: Not available
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

NFPA Ratings

Health: 0 Fire: 1 Reactivity: Not available
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Summary of Changes

Updated SDS: 3/22/2017

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CA/MA/MN/NJ/PA - California/ Massachusetts/Minnesota/New Jersey/Pennsylvania*; CAS - Chemical Abstracts Service; CFR - Code of Federal Regulations (US); CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CLP - Classification, Labelling, and Packaging; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSD - Dangerous Substance Directive; DSL - Domestic Substances List; EC – European Commission; EEC - European Economic Community; EIN - European Inventory of (Existing Commercial Chemical Substances); EINECS - European Inventory of Existing Commercial Chemical Substances; ENCS - Japan Existing and New Chemical Substance Inventory; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; ISHL - Japan Industrial Safety and Health Law; IUCLID - International Uniform Chemical Information Database; JP - Japan; Kow - Octanol/water partition coefficient; KR KECI Annex 1 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL); KR KECI Annex 2 - Korea Existing Chemicals Inventory (KECI) / Korea Existing Chemicals List (KECL) , KR - Korea; LD50/LC50 - Lethal Dose/ Lethal Concentration; LEL - Lower Explosive Limit; LLV - Level Limit Value; LOLI - List Of LIstsTM - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; MX – Mexico; NDSL – Non-Domestic Substance List (Canada); NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PEL- Permissible Exposure Limit; PH - Philippines; RCRA - Resource Conservation and Recovery Act; REACH- Registration, Evaluation, Authorisation, and restriction of Chemicals; RID - European Rail Transport; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TCCA – Korea Toxic Chemicals Control Act; TDG - Transportation of Dangerous Goods; TLV - Threshold Limit Value; TSCA - Toxic Substances Control Act; TW – Taiwan; TWA - Time Weighted Average; UEL - Upper Explosive Limit; UN/NA - United Nations /North American; US - United States; VLE - Exposure Limit Value (Mexico); WHMIS - Workplace Hazardous Materials Information System (Canada).

Other Information
Disclaimer:

Supplier gives no warranty whatsoever, including the warranties of merchantability or off fitness for a particular purpose. Any product purchased is sold on the assumption the purchaser shall determine the quality and suitability of the product. Supplier expressly disclaims any and all liability for incidental, consequential or any other damages arising out of the use or misuse of this product. No information provided shall be deemed to be a recommendation to use any product in conflict with any existing patent rights

RHEOLOGY TEST

Test Report
Timeplast

Client	Man Rendon
Company	Timeplast INC
Address	Orlando, Florida, 32708. United States
Sample Received	10/19/2023
Sample Source	Timeplast INC
Report Prepared	10/25/2023
Prepared By	
Title	Chief Executive Officer
Issued By	
Title	Laboratory Manager

DatapointLabs

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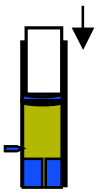
23 Dutch Mill Road, Ithaca, NY 14850
Phone: 607-266-0405 Fax: 607-266-0168
Toll-Free (U.S.): 1-888-328-2422

This data is available in True Digital format

dds

w w w .m atereali ty. com

Viscosity



Method	ASTM D3835-16 Determination of Properties of Polymeric Materials by Means of a Capillary Rheometer Gottfert	
Instrument	Rheometer RG25	
Specimen	form drying other preparation	pellets none none
Parameters	initial pressure barrel diameter die entry angle die diameter1mm die length5 & 20mm preheat time6min	0MPa 12mm 180°
Data Correction	Bagley and Rabinowitsch	
Precision	temperature+/- 0.1°C die inner diameter+/- 0.0069mm die length+/- 0.025mm	
Uncertainty	per standard	

Technique Notes:

Polymer rheology characterizes the complex flow behavior of plastics. A capillary rheometer measures viscosity as a function of temperature and shear rate. The Goettfert rheometer utilizes direct measurement of melt pressures through a side mounted pressure transducer.

Data are modeled using empirical or semi-empirical equations.

Testing Notes:

Viscosity Data

185 °C		200 °C		215 °C	
Shear Rate. s-1	**Viscosity. Pa·s**	**Shear Rate. s-1**	**Viscosity. Pa·ss**	**Shear Rate. s-1**	**Viscosity Pa·s**
10.8	1094.71	10.4	496.57	11.9	392.40
22.4	831.50	21.7	492.05	23.8	231.50
57.9	509.13	55.7	313.02	58.9	216.56
119.2	373.43	114.2	245.15	117.5	142.08
245.5	277.91	233.7	186.89	234.0	104.59
635.5	181.58	599.2	119.91	582.0	72.62
1302.4	129.30	1223.7	89.62	1160.6	48.28
2658	87.36	2496	66.17	2307	45.23
6770	46.35	6372	40.15	5732	33.66
13672	26.87	12875	24.71	11428	22.90

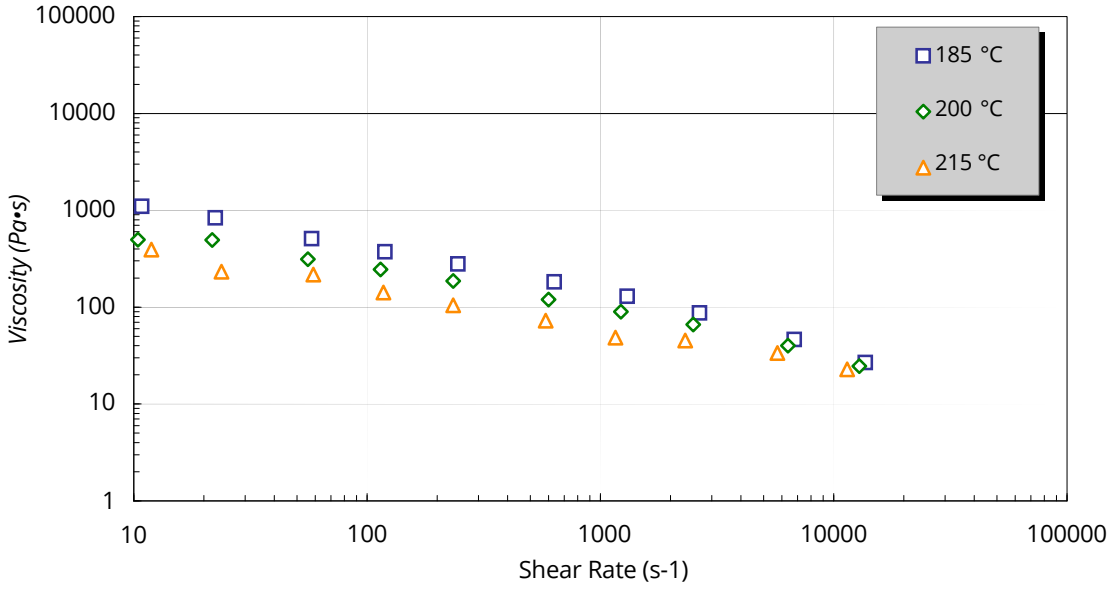
Tested By: JA
Certified By: SW
Test Date: 10/23/2023

Data in Matereality as

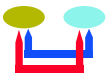
Capillary Viscosity

Viscosity Plot

Viscosity vs Shear Rate



Thermal Analysis



Method	ASTM D3418-21 Transition Temperatures of Polymers by Differential Scanning Calorimetry
Instrumen	TA Instruments DSC25
t Specimen	form piece drying none other preparationnone
Parameters	purge gas, purityN2, 99.99% purge gas rate25ml/min heat/cool rate10°C/min minimum temperature20°C maximum temperature220°C equilibration time5min weight 9.13 mg sample pansAl, volatile
Calibration Standards	temperatureIn, Zn heat flowIn
Unce rt ain ty	per standard

Technique Notes:

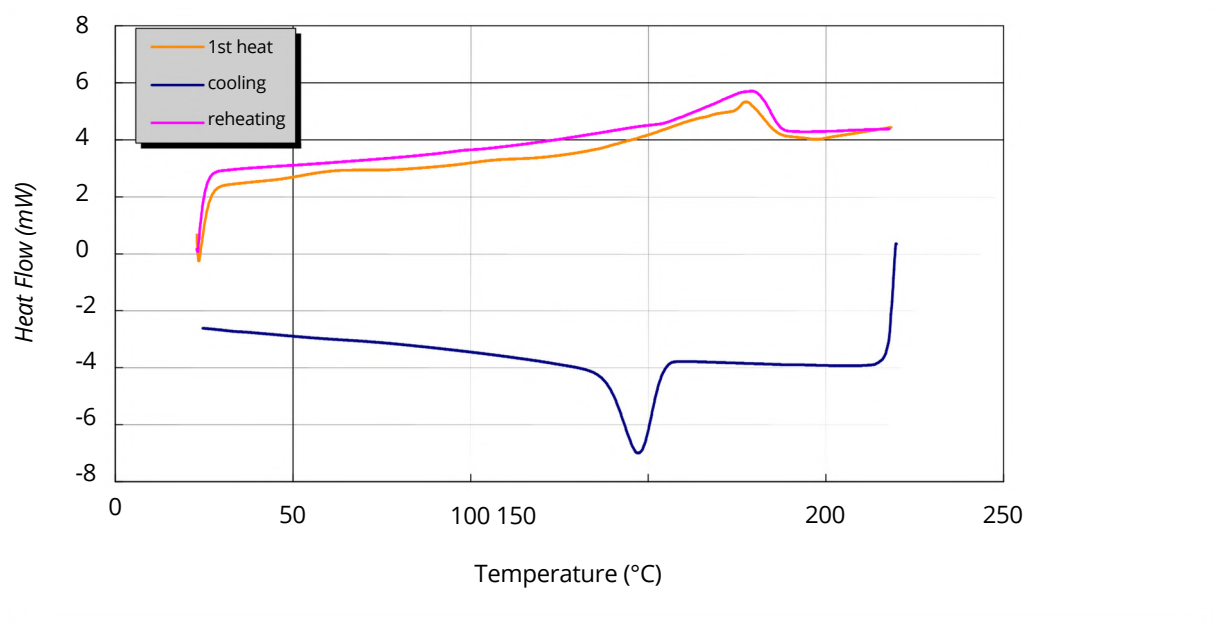
The reported transition temperatures and DSC plot are taken from the reheating scan.

Testing Notes:

Tested By:	SW
Certified By:	BC
Test Date:	10/24/2023

Data in Matereality as Thermal Analysis

DSC Plot



Transition Analysis

	Reheating
Onset	146 °C
Melt Peak	179 °C
Crystallization Peak	--- °C
Extrapolated End	182 °C
Enthalpy of Fusion	29.166 J/g
Enthalpy of Crystallization	--- J/g

Thermogravimetric Analysis

Method	ASTM E1131-20 Standard Test Method for Compositional Analysis by Thermogravimetry	
Instrumen	Perkin Elmer TGA7	
t Specimen	form drying other preparation	pellets none cut to size
Parameters	purge gas purge gas purity gas flow rate. gas switchover temperatu start temperature end temperature equilibration time initial sample weight	N2/Air 99.99% 25ml/min 600°C heating rate20°C/min 30°C 1000°C 10min 18.627mg
Calibration Standards	temperature mass	Alumel, Ni, Perkalloy 100 mg

Technique Notes:

Testing Notes:

Results (% weight)

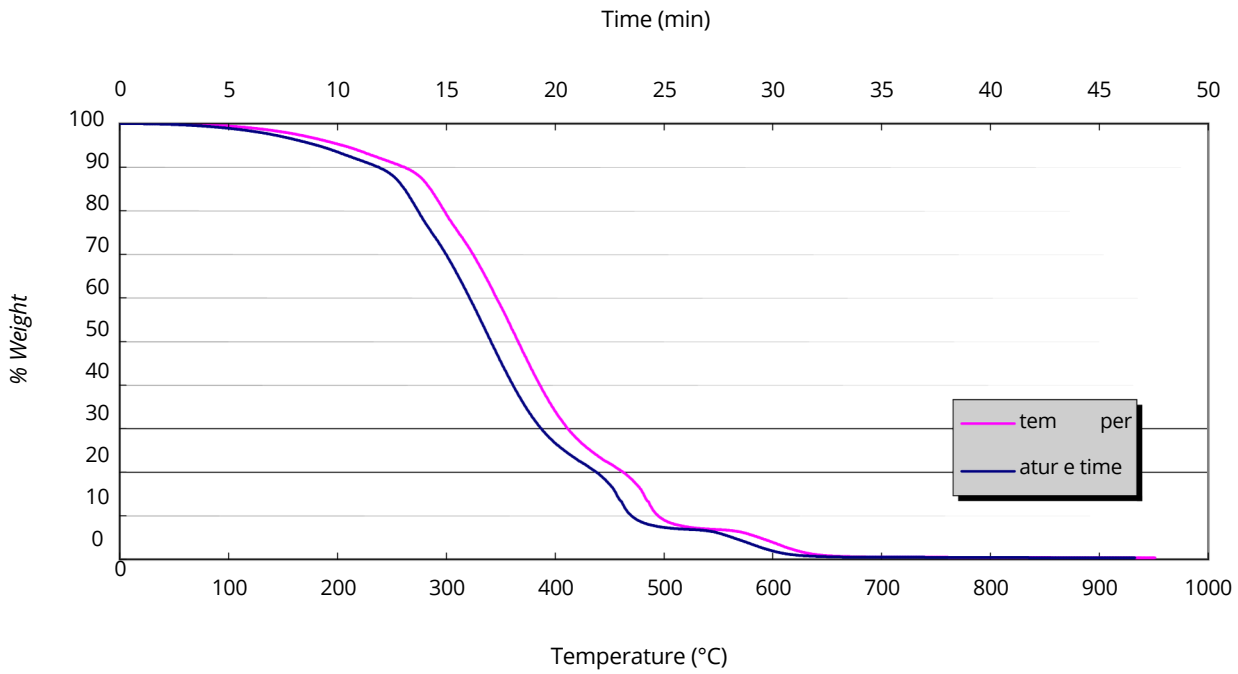
medium volatile	96.10
combustibles (carbon)	3.54
ash	0.36

TGA measurements are not included in our current scope of accreditation.

Data in Matereality as Thermogravimetric Analysis

Tested By:	SW
Certified By:	BC
Test Date:	10/25/2023

TGA Plot



Temp °C	Weight loss	Time	Weight loss