

# ChillerBody Patent Technology

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## Innovation in Personal Thermal Regulation

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ChillerBody Research Team

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### Executive Summary

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ChillerBody's **U.S. Patent #11,266,193** represents a breakthrough in personal thermal regulation technology, solving a critical problem that has plagued workers and athletes for decades: how to provide effective, portable, hands-free cooling that works with existing safety equipment and headwear. This whitepaper examines the technical innovation, competitive landscape, and market advantages of ChillerBody's patented universal-fit cooling insert.

#### Key Innovations:

- **Universal compatibility** with any hat, cap, or helmet (including ANSI-certified hard hats)
  - **Phase change material (PCM)** technology for consistent 20-30 minute cooling
  - **Lightweight design** (<2 oz) that doesn't impair movement or comfort
  - **Patent protection** creating significant barriers to entry for competitors
  - **Cost-effective** manufacturing enabling mass-market accessibility
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## The Problem: Limitations of Existing Cooling Solutions

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# Market Gap Analysis

## Existing Personal Cooling Solutions:

### 1. Cooling Vests (35% market share)

- **Technology:** Evaporative or phase change materials in vest form
- **Limitations:**
  - **Bulky and heavy** (5-15 lbs when activated)
  - **Restrictive** - impairs movement and work tasks
  - **Expensive** (\$150-\$400 per unit)
  - **Incompatible** with many work environments (confined spaces, climbing, etc.)
  - **Worker resistance** - uncomfortable for extended wear

### 2. Cooling Towels/Bandanas (30% market share)

- **Technology:** Evaporative cooling fabrics
- **Limitations:**
  - **Minimal cooling effect** (1-2°F core temp reduction)
  - **Requires frequent re-wetting** (every 30-60 minutes)
  - **Not hands-free** - must be held or repositioned
  - **Humidity-dependent** - ineffective in humid conditions
  - **Short duration** - dries out quickly

### 3. Ice Packs (20% market share)

- **Technology:** Frozen gel packs
- **Limitations:**
  - **Very short duration** (30-60 minutes)
  - **Requires constant freezer access**
  - **Bulky** - difficult to position and secure
  - **Condensation** - creates moisture issues
  - **Not designed for headwear** - doesn't fit hats/helmets

### 4. Active Cooling Devices (10% market share)

- **Technology:** Battery-powered fans or thermoelectric cooling
- **Limitations:**
  - **Heavy** (2-5 lbs with battery)
  - **Expensive** (\$200-\$800)

- **Limited battery life** (2-4 hours)
- **Maintenance** - requires charging, battery replacement
- **Failure risk** - electronics can malfunction

## 5. Misting Systems (<5% market share)

- **Technology:** Water mist evaporation
- **Limitations:**
  - **Not portable** - requires water and power infrastructure
  - **Stationary only** - workers must come to cooling station
  - **Expensive** (\$500-\$5,000+ installation)
  - **Not practical** for mobile workers

## Critical Unmet Needs

### What the Market Needed:

1. **Universal compatibility** - works with existing headwear and safety equipment
2. **Lightweight** - doesn't burden workers or impair performance
3. **Long duration** - lasts full work shift or athletic event
4. **Hands-free** - stays in place during activity
5. **Cost-effective** - affordable for individual workers and small employers
6. **Simple activation** - no special equipment or infrastructure required
7. **Comfortable** - workers/athletes actually use it consistently
8. **Reusable** - sustainable and economical

**No existing solution met all these criteria—until ChillerBody.**

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## The Innovation: Universal-Fit Cooling Insert

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### Patent Overview

**U.S. Patent #11,266,193**

**Title:** "Cooling Insert for Headwear"

**Issued:** March 1, 2022

**Inventor:** Peter Bowman

**Assignee:** ChillerBody International, LLC

## Patent Claims:

The patent covers a cooling insert specifically designed to fit within the sweatband area of hats, caps, and helmets, featuring:

- **Universal fit mechanism** that adapts to various headwear sizes and styles
- **Phase change material composition** optimized for head cooling
- **Flexible, conforming design** that maintains contact with forehead
- **Leak-proof encapsulation** preventing moisture issues
- **Lightweight construction** (<2 oz) for comfort
- **Reusable design** for 500+ freeze cycles

## How It Works

### Step 1: Activation

- Place cooling insert in freezer for **2+ hours**
- Phase change material freezes at **32°F (0°C)**
- No special equipment required - any standard freezer works

### Step 2: Installation

- Insert into **sweatband** of any hat, cap, or helmet
- **Universal fit** - adapts to different headwear styles
- **Secure placement** - stays in position during activity
- **ANSI/Z89.1 compatible** - doesn't compromise hard hat safety

### Step 3: Cooling

- **Phase change** begins as material warms to body temperature
- **Consistent cooling** at 50-60°F for **20-30 minutes**
- **Targets forehead** - high blood flow area for effective cooling
- **Hands-free** - no adjustment needed during use

### Step 4: Reuse

- Remove insert and **refreeze**
- **500+ freeze cycles** - years of use
- **No degradation** in cooling performance
- **Sustainable** - no disposable components

## Key Design Features

## 1. Universal Fit Mechanism

- **Flexible dimensions:** 4" × 6" × 0.5" (fits 95% of headwear)
- **Conforming shape:** Curves to match forehead contour
- **Adjustable positioning:** Can be placed anywhere in sweatband
- **Secure retention:** Friction fit prevents slipping

## 2. Phase Change Material Selection

- **Optimal melting point:** 50-60°F (10-15°C)
- **High latent heat capacity:** Stores maximum cooling energy
- **Non-toxic composition:** Safe for skin contact
- **Stable performance:** Consistent across 500+ cycles

## 3. Encapsulation Technology

- **Leak-proof sealing:** Prevents moisture escape
- **Durable materials:** Withstands repeated freeze/thaw cycles
- **Flexible construction:** Maintains comfort during use
- **Lightweight:** <2 oz total weight

## 4. Safety Compliance

- **ANSI/Z89.1 certified:** Compatible with hard hats without modification
- **Non-conductive:** Safe for electrical work
- **Hypoallergenic:** No skin irritation
- **FDA-compliant materials:** Food-grade safe

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# Technical Specifications

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## Physical Properties

### Dimensions:

- **Length:** 6 inches (15.2 cm)
- **Width:** 4 inches (10.2 cm)
- **Thickness:** 0.5 inches (1.3 cm)
- **Weight:** 1.8 oz (51 g)

### Materials:

- **PCM:** Proprietary blend (melting point 50-60°F)

- **Encapsulation:** Medical-grade polymer
- **Sealing:** Heat-sealed edges (leak-proof)

#### **Performance:**

- **Cooling duration:** 20-30 minutes (depending on ambient temperature)
- **Cooling capacity:** 50-80 BTU
- **Core temperature reduction:** 0.3-0.5°C (0.5-0.9°F)
- **Skin temperature reduction:** 2-4°C (3.6-7.2°F) at forehead

#### **Durability:**

- **Freeze cycles:** 500+ (tested to 1,000+)
- **Shelf life:** 5+ years
- **Operating temperature range:** -20°F to 120°F
- **Storage temperature:** -20°F to 100°F

## **Thermal Performance Data**

### **Laboratory Testing Results:**

#### **Test 1: Cooling Duration (85°F ambient, moderate activity)**

- **Minutes 0-10:** 55°F average surface temperature
- **Minutes 10-20:** 58°F average surface temperature
- **Minutes 20-30:** 62°F average surface temperature
- **After 30 minutes:** Cooling effect diminishes
- **Conclusion:** Effective cooling for 20-30 minutes

#### **Test 2: Core Temperature Reduction (Human subjects, n=50)**

- **Baseline:** 98.6°F (37.0°C) average core temperature
- **With cooling insert:** 98.1°F (36.7°C) average after 30 minutes
- **Reduction:** 0.5°F (0.3°C) average
- **Statistical significance:** p<0.01

#### **Test 3: Forehead Skin Temperature (Infrared thermography)**

- **Baseline:** 95°F (35°C) average forehead temperature
- **With cooling insert:** 89°F (31.7°C) average after 30 minutes
- **Reduction:** 6°F (3.3°C) average
- **Cooling zone:** 4-6 inch diameter area

#### Test 4: Reusability (Accelerated aging)

- **Freeze/thaw cycles:** 1,000 cycles tested
- **Performance degradation:** <5% after 500 cycles, <10% after 1,000 cycles
- **Leak rate:** 0% (no leaks observed)
- **Conclusion:** Exceeds 500-cycle design specification

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## Phase Change Material Technology

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### What are Phase Change Materials?

#### Definition:

Phase Change Materials (PCMs) are substances that absorb or release large amounts of latent heat when changing phase (solid ↔ liquid) at a specific temperature.

#### Thermal Energy Storage:

- **Sensible heat:** Temperature change (e.g., ice water warming from 32°F to 50°F)
- **Latent heat:** Phase change (e.g., ice melting at 32°F) - **much higher energy storage**

#### Example:

- Warming 1 lb of ice from 32°F to 33°F: **0.5 BTU** (sensible heat)
- Melting 1 lb of ice at 32°F: **144 BTU** (latent heat)
- **Latent heat is 288x more energy** for same temperature change

### ChillerBody's PCM Selection

#### Optimal Melting Point: 50-60°F (10-15°C)

#### Why this temperature range?

1. **Comfortable cooling:** Not too cold (no frostbite risk), not too warm (effective cooling)
2. **Long duration:** Slow phase change = extended cooling time
3. **Practical activation:** Standard freezer (-10°F to 0°F) easily freezes material
4. **Ambient stability:** Won't melt during storage/transport in most climates

#### PCM Composition:

- **Proprietary blend** of organic compounds
- **Non-toxic:** Safe for skin contact, FDA-compliant
- **Stable:** No degradation over 500+ freeze/thaw cycles
- **High latent heat:** 50-80 BTU per insert

- **Consistent performance:** Narrow melting range ( $\pm 2^{\circ}\text{F}$ )

## Advantages Over Other Cooling Technologies

### vs. Ice/Water:

- **Consistent temperature:** PCM maintains  $50\text{-}60^{\circ}\text{F}$  vs. ice at  $32^{\circ}\text{F}$  (too cold)
- **No condensation:** Sealed PCM vs. dripping ice
- **Lightweight:** 1.8 oz vs. 8-16 oz for equivalent ice
- **Comparable duration:** PCM lasts 20-30 minutes, similar to ice

### vs. Evaporative Cooling:

- **Humidity-independent:** PCM works in any humidity vs. evaporative (requires low humidity)
- **No re-wetting:** PCM provides 20-30 minutes of cooling vs. evaporative (requires re-wetting every 30-60 min)
- **Consistent performance:** PCM doesn't dry out

### vs. Active Cooling (Battery-Powered):

- **No power required:** PCM is passive vs. active (requires batteries/charging)
- **Lighter weight:** 1.8 oz vs. 2-5 lbs with battery
- **No maintenance:** PCM just freeze/reuse vs. active (battery replacement, repairs)
- **Lower cost:** \$39.95 vs. \$200-\$800

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## Patent Protection and IP Landscape

### ChillerBody's Patent Portfolio

#### Issued Patents:

- **U.S. Patent #11,266,193** (March 1, 2022)
  - **Claims:** Universal-fit cooling insert for headwear
  - **Coverage:** Design, materials, application method
  - **Expiration:** March 1, 2042 (20 years from filing)

#### Patent Strength:

- **Novelty:** No prior art for universal-fit headwear cooling insert
- **Non-obviousness:** Unique combination of features not obvious to skilled artisan
- **Utility:** Clear practical application with demonstrated benefits
- **Enablement:** Detailed specification allows reproduction

## Barriers to Entry:

- **Design around difficulty:** Core features (universal fit, PCM selection, placement) are essential to function
- **First-mover advantage:** ChillerBody has 2+ years of market presence
- **Brand recognition:** "ChillerBody" becoming synonymous with headwear cooling
- **Distribution relationships:** Established partnerships with major distributors

## Competitive IP Landscape

### Cooling Vest Patents:

- **100+ patents** for cooling vests (evaporative, PCM, active)
- **Crowded space:** Difficult to differentiate
- **No universal-fit headwear patents** identified in prior art search

### Headwear Cooling Patents:

- **Evaporative hats:** 10-15 patents (different mechanism)
- **Ice pack hats:** 5-10 patents (different form factor, not universal-fit)
- **Active cooling hats:** 3-5 patents (battery-powered, different mechanism)
- **ChillerBody's universal-fit PCM insert: Unique in patent landscape**

### Freedom to Operate:

- **No blocking patents** identified
- **Clear differentiation** from existing patents
- **Low infringement risk**

## Future IP Strategy

### Planned Patent Filings:

1. **Warming insert** (Q1 2026): Cold weather thermal regulation
2. **Extended duration PCM** (Q3 2026): 6-8 hour cooling
3. **Smart insert** (2027): Temperature monitoring, heat stress alerts
4. **Rapid activation** (2027): Chemical activation (no freezer required)

### International Protection:

- **PCT application** filed (international patent pending)
- **Target markets:** Canada, Mexico, Middle East, Europe, Asia-Pacific
- **Expected filings:** 2026-2027

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# Competitive Advantages

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## Product Advantages

### 1. Universal Compatibility

- **Only solution** that works with any hat, cap, or helmet
- **ANSI/Z89.1 certified** - compatible with hard hats without modification
- **No special headwear required** - use existing equipment

### 2. Performance

- **20-30 minute duration** - effective cooling for headwear
- **Consistent cooling** - phase change maintains steady temperature
- **Effective** - 0.3-0.5°C core temp reduction (clinically significant)

### 3. Practicality

- **Lightweight** (<2 oz) - doesn't burden user
- **Hands-free** - stays in place during activity
- **Simple activation** - just freeze (no special equipment)
- **Reusable** - 500+ cycles (years of use)

### 4. Cost

- **\$39.95 for 2-pack** - most affordable in category
- **\$0.50-\$1.00 per use** - lowest cost per hour of cooling
- **No ongoing costs** - no batteries, no consumables

## Market Advantages

### 1. First-Mover

- **2+ years** of market presence
- **Patent protection** until 2042
- **Brand recognition** building

### 2. Distribution

- **10+ major distributors** (White Cap, City Electric, Fastenal)
- **Fortune 500 customers** (Disney, CSX, Nucor Steel)
- **Multi-channel** (B2B, DTC, retail)

### 3. Validation

- **\$500K+ revenue** in 2024
- **142 customers** Q4 2024
- **25% MoM growth**
- **NBC TODAY Show** feature

### 4. Scalability

- **Manufacturing capacity:** 1M units/month
  - **Supply chain:** Established, reliable
  - **Unit economics:** 65-70% gross margins
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## Manufacturing and Scalability

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### Current Manufacturing

#### Production Facility:

- **Location:** Contract manufacturer (U.S.-based)
- **Capacity:** 100,000 units/month (current)
- **Scalability:** 1,000,000 units/month (with additional lines)
- **Quality control:** ISO 9001 certified

#### Manufacturing Process:

1. **PCM formulation:** Proprietary blend mixed to specification
2. **Encapsulation:** PCM sealed in medical-grade polymer pouches
3. **Quality testing:** Leak test, freeze/thaw cycle test, weight verification
4. **Packaging:** 2-pack or 4-pack retail packaging
5. **Distribution:** Ship to distributors or direct to customers

#### Cost Structure:

- **Materials:** \$4-6 per unit (PCM, encapsulation, packaging)
- **Labor:** \$1-2 per unit (assembly, QC)
- **Overhead:** \$1-2 per unit (facility, equipment)
- **Total COGS:** \$6-10 per unit
- **Wholesale price:** \$18-20 per unit (B2B)
- **Retail price:** \$39.95 for 2-pack (\$20 per unit)

- **Gross margin:** 65-70%

## Scalability Plan

### Phase 1 (Current - 2025):

- **Capacity:** 100,000 units/month
- **Target:** \$1.2M revenue (2025)
- **Focus:** Optimize processes, reduce COGS

### Phase 2 (2026):

- **Capacity:** 300,000 units/month (3x scale-up)
- **Target:** \$4.5M revenue
- **Investment:** Additional production lines (\$500K)

### Phase 3 (2027-2028):

- **Capacity:** 1,000,000 units/month (10x scale-up)
- **Target:** \$12-28M revenue
- **Investment:** Dedicated facility or vertical integration (\$2-3M)

### Phase 4 (2029+):

- **International manufacturing:** Asia-Pacific, Middle East
- **Vertical integration:** In-house PCM formulation
- **Automation:** Reduce labor costs, increase capacity

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## Product Roadmap and Future Innovation

### Current Product (2024-2025)

#### Cooling Inserts:

- **2-pack:** \$39.95 (consumer)
- **4-pack:** \$69.95 (consumer)
- **Bulk pricing:** \$18-20 per unit (B2B)

#### Applications:

- Baseball caps, hard hats, sports helmets, winter hats

### Near-Term Extensions (2026)

## 1. Warming Inserts (Q1 2026)

- **Technology:** Phase change material with 90-100°F melting point
- **Activation:** Microwave or hot water
- **Duration:** 2-4 hours of warming
- **Applications:** Cold weather work, winter sports, outdoor events
- **Market:** \$2+ billion cold weather market

## 2. Extended Duration Inserts (Q3 2026)

- **Technology:** Higher latent heat PCM
- **Duration:** 6-8 hours of cooling
- **Applications:** Long shifts, endurance events
- **Price premium:** \$49.95 for 2-pack

## 3. Rapid Activation Inserts (Q4 2026)

- **Technology:** Chemical activation (no freezer required)
- **Activation:** Squeeze to activate
- **Duration:** 2-3 hours
- **Applications:** Emergency response, remote locations
- **Price:** \$59.95 for 2-pack (single-use or limited reuse)

# Long-Term Innovation (2027+)

## 1. Smart Inserts (2027)

- **Technology:** Embedded temperature sensors, Bluetooth connectivity
- **Features:**
  - Real-time core temperature estimation
  - Heat stress alerts (smartphone app)
  - Acclimatization tracking
  - Integration with wearables (Apple Watch, Garmin)
- **Applications:** High-risk workers, elite athletes
- **Price:** \$99.95 for 2-pack

## 2. Custom Formulations (2027-2028)

- **Technology:** PCM blends optimized for specific applications
- **Variants:**

- **Arctic** (40-50°F): Extreme heat environments
- **Tropical** (60-70°F): Moderate heat, longer duration
- **Athletic** (50-55°F): Maximum performance benefit
- **Applications:** Vertical-specific solutions

### 3. OEM Partnerships (2027+)

- **Strategy:** License technology to major brands
- **Partners:** Hard hat manufacturers (MSA, 3M), sports equipment (Nike, Under Armour)
- **Revenue model:** Licensing fees + royalties

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## Conclusion

ChillerBody's **U.S. Patent #11,266,193** represents a genuine breakthrough in personal thermal regulation, solving a problem that has plagued workers and athletes for decades. The universal-fit cooling insert combines **phase change material technology, lightweight design, long duration, and cost-effectiveness** in a way that no existing solution has achieved.

With **patent protection until 2042, proven market traction** (\$500K+ revenue, 142 customers), and **significant barriers to entry**, ChillerBody is positioned to become the category-defining brand in personal headwear cooling. The technology platform enables expansion into warming products, extended duration variants, and smart inserts, creating a **multi-product, multi-market opportunity** worth billions.

**For investors, the combination of strong IP protection, proven product-market fit, and scalable manufacturing creates a compelling opportunity to participate in the personal thermal regulation revolution.**

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## References and Data Sources

1. **U.S. Patent and Trademark Office** - Patent #11,266,193
2. **Phase Change Material Research** - NASA, DOE, academic literature
3. **Thermal Regulation Science** - Physiology Reviews, Journal of Applied Physiology
4. **Market Data** - Industry reports, competitor analysis
5. **ChillerBody Internal Data** - Laboratory testing, customer feedback, sales data

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## About ChillerBody

ChillerBody International, LLC is the inventor and manufacturer of patented universal-fit cooling and warming inserts for headwear. Our mission is to prevent heat-related illness and death while enhancing performance through innovative, accessible thermal regulation technology.

**Product Information:**

- Website: [www.ChillerBody.com](http://www.ChillerBody.com)
- Email: [info@chillerbody.com](mailto:info@chillerbody.com)
- Phone: (609) 209-5752

**For Investors:**

- Accredited investors can access our investor portal at [www.ChillerBody.com/invest](http://www.ChillerBody.com/invest)
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