CAFFEVOLVE™

COMPLETE TECHNICAL DOCUMENTATION

Seven-Phase Brewing Process with In-Stream Additive Integration

"Coffee Without a Curfew"

Tailored. Enhanced. Any time of day.

Brent Langevin, Founder
(571) 464-9451

Caffevolve Corporation
Kenosha, Wisconsin

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Executive Summary

The CAFFEVOLVE™ brewing system represents a patent-pending innovation in coffee customization, enabling precise caffeine control (0-100%) through a unique dual-hopper gravimetric 'blend-then-grind' methodology combined with pharmaceutical-grade in-stream additive dispensing. This document provides complete technical specifications for the seven-phase brewing process across all three product tiers.

Core Innovation:

Unlike conventional brewers that offer only fixed caffeine levels, CAFFEVOLVE proportionally blends regular and decaffeinated beans using precision gravimetric dispensing before grinding, ensuring particle-level homogeneity impossible with pre-ground mixing. An active reciprocating agitator arm standardized across all models ensures thorough bean integration. Pharmaceutical-grade powder additives dispense directly into the flowing coffee stream during brewing (in-stream integration) rather than after brewing completion, leveraging natural turbulence for superior mixing without additional mechanical stirring.

Product Strategy:

Asset-light IP licensing model targeting premium appliance manufacturers (Breville, Fellow, Ninja) rather than direct manufacturing. Three-tier product line spans consumer ($199-$599) to commercial ($2,499+) markets with consistent core technology across all tiers.

Key Differentiators:

- Gravimetric bean dispensing (±0.1g accuracy) across all models
- Active mechanical bean blending via reciprocating agitator arm (standardized)
- In-stream additive dispensing during brewing (30-50% brew volume)
- Pharmaceutical-grade dual load cell verification (±5mg accuracy)
- Seven-phase integrated process for maximum customization and quality

Product Tier Overview

CAFFEVOLVE's three-tier product strategy maintains consistent core functionality while scaling capacity, interface sophistication, and feature sets across consumer and commercial markets:

ORIGINARA ($199 - Entry Consumer Model)

• Bean Hoppers: 250g capacity each (regular and decaf)
• Bean Dispensing: Gravimetric (load cell + gate valve)
• Active Blending: Reciprocating agitator arm (standard)
• Water Reservoir: 40-50 oz (1.2-1.5L)
• Carafe: Glass carafe with warming plate
• Additive System: 6 user-fillable chambers | Pharmaceutical-grade micro-auger dispensing
• User Profiles: 2 profiles, 3 saved presets per user
• Caffeine Control: 0-100% in user-selected increments
• Grind Settings: Fine/Medium/Coarse for drip brewing
• Interface: Rotary dial with digital display
• Target Market: First-time upgraders, budget-conscious consumers

ADVANCARA ($599 - Premium Home Model)

• Bean Hoppers: 500-750g capacity each (regular and decaf)
• Bean Dispensing: Gravimetric (load cell + gate valve)
• Active Blending: Reciprocating agitator arm (standard)
• Water Reservoir: 50-60 oz (1.5-1.8L)
• Carafe: Customer choice at purchase - Glass carafe OR thermal carafe
• Additive System: 8 user-fillable chambers | Pharmaceutical-grade micro-auger dispensing
• User Profiles: 5 profiles, 5 saved presets per user
• Caffeine Control: 0-100% in 1% increments (continuous control)
• Grind Settings: Fine/Medium/Coarse for drip brewing
• Interface: Touchscreen interface
• Target Market: Coffee enthusiasts, wellness-focused consumers

CULMINARA ($2,499+ - Commercial/Professional Model)

COMMERCIAL USE ONLY: Designed for cafes, offices, hospitality venues

• Bean Hoppers: 1,000g capacity each (regular and decaf)
• Bean Dispensing: Gravimetric (load cell + gate valve)
• Active Blending: Reciprocating agitator arm (standard)
• Water Reservoir: 80-96 oz (2.4-2.8L)
• Carafe: Thermal/vacuum carafe only (commercial durability, no power consumption)
• Additive System: 12 user-fillable chambers | Pharmaceutical-grade micro-auger dispensing
• User Profiles: 20 profiles, 10 saved presets per user

• Caffeine Control: 0-100% in 0.1% precision increments
• Grind Settings: Fine/Medium/Coarse for drip brewing
• Interface: Touchscreen interface
• Additional Features: Optional ultrasonic mixing, climate-controlled additive storage
• Target Market: Commercial environments requiring high-volume, consistent quality

Key Design Principle:

All three models share the same core patent-protected technology (gravimetric dispensing, active blending, in-stream additive integration), with differentiation occurring through capacity scaling, interface sophistication, and premium feature additions. This ensures unified patent protection while addressing distinct market segments.

Complete Seven-Phase Brewing Process

The CAFFEVOLVE system executes seven distinct phases to deliver customized coffee with precise caffeine control and pharmaceutical-grade wellness supplementation:

Phase 1: User Input & System Configuration

Control Interface Selection

Originara: Rotary dial with digital display showing caffeine %, cup size, strength
Advancara/Culminara: Touchscreen interface with visual preset management and saved profiles

User Selections:

1. Caffeine Percentage:
   • Originara: User-selected increments (0-100%)
   • Advancara: 1% increments (0-100%)
   • Culminara: 0.1% precision increments (0-100%)

2. Cup/Carafe Size:
   • Single-cup options: 8oz, 12oz, 16oz, or custom volume
   • Carafe options: 40oz, 50oz, 60oz (model-dependent)
   • Direct-to-cup: Any user-provided mug/cup (all models)

3. Brew Strength:
   • Light: 15g coffee per 12oz water
   • Regular: 17g coffee per 12oz water
   • Bold: 20g coffee per 12oz water
   • Custom: User-adjustable ratio

4. Additive Selection:
   • Choose which chambers dispense (checkmark selection)
   • Verify dosage amounts per chamber
   • Enable/disable individual additives for this brew

5. Grind Size:
   • 3 settings: Fine / Medium / Coarse for drip brewing
   • Burr type: Conical (40-50mm) or flat (58-83mm), stainless steel or ceramic

User Profile & Preset System

All models support user profiles with saved presets capturing complete brewing configurations:

• Originara: 2 profiles, 3 presets each (6 total saved configurations)
• Advancara: 5 profiles, 5 presets each (25 total saved configurations)
• Culminara: 20 profiles, 10 presets each (200 total saved configurations)

Each preset stores: Caffeine percentage, cup size, brew strength, additive selections with dosages, grind size, and user-assigned label (e.g., 'Morning Boost', 'Evening Decaf', 'Afternoon Mild')

System Calculation

Microprocessor calculates exact bean proportions based on selected caffeine percentage:

Example: 60% caffeine selection = 60% regular beans + 40% decaf beans

System determines total bean mass based on cup size and strength setting (typical range: 15-20g coffee per 12oz water, adjustable by strength).

Phase 2: Dual-Hopper Gravimetric Bean Dispensing

Bean Storage & Hopper System

Hopper A (Regular Caffeinated Beans):

• Capacity by model: Originara 250g, Advancara 500-750g, Culminara 1,000g
• UV-protective opaque construction preserves freshness
• One-way valve prevents moisture intrusion
• Load cell monitoring for real-time bean level tracking

Hopper B (Decaffeinated Beans):

• Identical capacity and specifications to Hopper A
• Completely separate pathway ensures zero cross-contamination
• Independent load cell monitoring system

Gravimetric Dispensing Mechanism (All Models)

CAFFEVOLVE employs gravimetric (weight-based) bean dispensing across all three product tiers for maximum accuracy and reliability:

System Architecture:

• Each hopper mounted on individual precision load cell platform (±0.1g accuracy)
• Electromechanical gate valve (servo-actuated) at base of each hopper
• Real-time weight monitoring via microprocessor
• Gravity-flow design (beans flow naturally when gate opens)

Dispensing Process:

1. System Calculation: Microprocessor calculates target bean masses for both hoppers based on user selections
2. Gate Opening: Both gate valves open simultaneously
3. Gravity Flow: Beans flow by gravity from hoppers into blending chamber below
4. Real-Time Monitoring: Load cells continuously measure hopper weight during flow
5. Precision Cutoff: When target mass is reached (±0.1g), respective gate valve closes
6. Verification: System confirms both hoppers dispensed correct amounts before proceeding

Example: 60% Caffeine, 12oz Cup

User selections: 60% caffeine, 12oz cup, regular strength

System calculation: 18g total beans required (12oz × 1.5g/oz ratio)

• Hopper A (regular) target: 10.8g (60% × 18g)
• Hopper B (decaf) target: 7.2g (40% × 18g)

Dispensing execution:

• Hopper A: Load cell reads 240.0g → 239.0g → 238.5g → 238.0g → 237.5g → 237.2g → STOP (10.8g dispensed)
• Hopper B: Load cell reads 240.0g → 239.5g → 238.5g → 237.8g → STOP (7.2g dispensed)

• Blend accuracy achieved: ±1% of target ratio

• Total dispensing time: 10-15 seconds

Advantages of Gravimetric Method

• Superior Accuracy: Weight-based measurement eliminates volumetric variation from bean size, density, or age differences
• Simplicity: Fewer moving parts than auger-based systems (no motors on hoppers, no auger wear)
• Cost-Effectiveness: Load cells and gate valves cost less than stepper motor/auger assemblies
• Reliability: Minimal mechanical complexity reduces failure points and maintenance requirements
• Universal Applicability: Works identically regardless of bean origin, roast level, or moisture content
• Self-Calibrating: Electronic load cell zeroing requires no physical adjustment

Pre-Grind Blending Chamber

Funnel-shaped chamber positioned directly beneath both hoppers:

• Cone angle: 45-60° for complete drainage
• Capacity: 25-40g (handles largest single-serve portions plus margin)
• Interior coating: Anti-static treatment prevents bean adhesion
• Transparent window (select models): Visual confirmation of bean blend
• Direct feed architecture: Chamber outlet positioned directly above grinder inlet for zero-retention transfer
• Gravity-assisted evacuation: No horizontal transfer or residual retention

Phase 3: Active Bean Blending

After proportional gravimetric bean dispensing, the system executes a critical active blending phase ensuring particle-level homogeneity essential for precise caffeine customization. This mechanical blending process is standardized across all three product tiers.

Reciprocating Agitator Arm System

A stepper motor-driven agitator arm sweeps through the blending chamber in a controlled arc pattern:

Technical Specifications:

- Arc pattern: 180° sweep (full semicircle)
- Sweep cycles: 5-6 complete cycles per blend
- Cycle duration: 2-3 seconds total
- Motor type: Stepper motor with precise rotation count control
- Arm design: Optimized geometry for maximum bean displacement
- Home position: Arm retracts to non-interference position after blending

Blending Action:

The reciprocating arm creates active mechanical agitation that thoroughly integrates regular and decaf beans:

1. Arm sweeps from 0° to 180° (left to right)
2. Beans displaced and tumbled during sweep
3. Arm reverses direction, sweeps 180° to 0° (right to left)
4. Process repeats for 5-6 complete cycles
5. Each sweep creates cascading effect, preventing stratification
6. Particle-level homogenization achieved impossible with passive tumbling

Standardization Across Models

CRITICAL: The reciprocating agitator arm mechanism is identical across Originara, Advancara, and Culminara models:

- Same stepper motor specifications
- Same 180° arc pattern
- Same 5-6 sweep cycle count
- Same 2-3 second duration
- Provides consistent blend accuracy (±1%) across all price points

This standardization ensures:

- Uniform patent protection
- Simplified manufacturing (single component design)

• Consistent quality regardless of model tier
• Cost efficiency through volume production

Post-Blend Release

Upon completion of blending cycles:

• Agitator arm returns to home position (fully retracted)
• Gravity-fed chamber immediately releases homogeneous blend
• Beans drop directly into grinder below through zero-retention outlet
• No cross-contamination between different caffeine blend ratios
• Chamber completely evacuates (no residual beans)

Total Phase 3 Duration: 2-3 seconds (blending) + 1-2 seconds (release) = 3-5 seconds

Phase 4: Precision Grinding

Grinder Integration & Specifications

Burr type options:

- Conical burrs: 40-50mm diameter
- Flat burrs: 58-83mm diameter
- Material: Hardened steel or ceramic
- Position: Directly beneath blending chamber—beans drop straight in
- Zero-retention design: No grounds remain between brew cycles

Grind Execution by Size

Fine grind (bold/strong drip):

- RPM: 400-600
- Duration: 20-25 seconds
- Particle size: 0.5-0.8mm

Medium grind (standard drip):

- RPM: 800-1000
- Duration: 12-15 seconds
- Particle size: 0.8-1.2mm

Coarse grind (milder brew):

- RPM: 1200-1400
- Duration: 8-10 seconds
- Particle size: 1.2-1.6mm

Critical Blend Homogenization During Grinding

The 8-25 second grinding process provides final mixing stage ensuring complete caffeine distribution:

1. Regular and decaf beans (already proportionally blended by gravimetric dispensing and agitator arm) pass through burrs together
2. Both bean types fracture identically due to same cellular structure and hardness (decaffeination doesn't alter physical properties)
3. Resulting grounds are particle-level homogeneous
4. Impossible to visually or mechanically separate regular from decaf particles
5. Every coffee particle contains exact proportional caffeine content
6. No stratification possible—molecular-level integration achieved

Grounds Transfer

Ground coffee falls directly into drip basket:

• Static-reducing chute prevents clumping
• Cone-shaped or flat-bottom basket (model-dependent)
• Paper filter or permanent metal filter holds grounds
• Even distribution across basket floor for uniform extraction

Phase 5: Multi-Phase Drip Brewing Extraction

Water Heating System

Heating technology varies by model tier:

Originara:

• Instant heating coil with single-pass heat exchanger
• Power: 1000W
• Heat-up time: 45-60 seconds to brewing temperature

Advancara:

• Thermoblock on-demand heating
• Power: 1400W
• Heat-up time: 30-45 seconds to brewing temperature

Culminara:

• Boiler reservoir system maintains constant ready temperature
• Power: 1800W
• Maintains 200°F ready temperature continuously
• Instant brewing availability (no heat-up wait)

Temperature Control (All Models):

• PID controller maintains ±2°F precision throughout brew cycle
• Pre-infusion temperature: 200-204°F
• Brewing temperature: 195-205°F (optimized for extraction)
• Temperature consistency regardless of ambient conditions

Shower Head Water Delivery

Precision water distribution system:

• 5-9 spray holes arranged in circular pattern
• Even saturation across entire coffee bed
• Prevents channeling (water finding path of least resistance)
• Creates uniform extraction across all grounds
• Flow control maintains consistent drip rate

Multi-Phase Brewing Process

Phase 5a - Bloom (30-45 seconds):

• Water delivery: 30% of total brew water
• Purpose: Initial grounds wetting, CO_2 release
• Action: Grounds 'bloom' and expand as trapped gas escapes
• Pause: Allows complete degassing before extraction begins
• Example (12oz brew): 3.6oz water delivered

Phase 5b - First Extraction (60-90 seconds):

• Water delivery: 40% of total brew water
• Purpose: Primary extraction of coffee solubles
• Flow rate: 1.5-2.0 oz/minute
• Coffee begins dripping into carafe or cup
• Example (12oz brew): 4.8oz water delivered
• NOTE: Additive dispensing triggers during this phase (see Phase 6)

Phase 5c - Second Extraction (60-90 seconds):

• Water delivery: Remaining 30% of total brew water
• Purpose: Complete extraction cycle
• Maintains consistent temperature and flow
• Final soluble extraction from grounds
• Example (12oz brew): 3.6oz water delivered

Phase 5d - Drawdown (30-60 seconds):

• No new water added
• Remaining liquid drains through coffee bed
• Final extraction of residual solubles
• Drip rate gradually slows to completion
• Grounds fully exhausted at end of phase

Total Brew Time by Volume

• 8oz cup: 3.5-4 minutes
• 12oz cup: 4-5 minutes
• 16oz cup: 5-6 minutes
• Full carafe (60oz): 8-10 minutes

Extraction Chemistry & Uniformity

Custom caffeine blends extract uniformly because:

1. Chemical Similarity: Regular and decaf beans are chemically identical except for caffeine content (decaffeination removes caffeine only, all other compounds remain)

2. Structural Uniformity: Identical cellular structure means identical extraction rates—water penetrates both bean types at same speed
3. Particle Size Distribution: Uniform grind for both bean types ensures consistent extraction surface area
4. Molecular Integration: Particle-level blending prevents any stratification during brewing
5. No Separation: No possibility for lighter/heavier particles to separate—all particles extract simultaneously

Target extraction parameters:

• TDS (Total Dissolved Solids): 1.15-1.35%
• Extraction yield: 18-22% of coffee mass
• Optimal flavor balance achieved regardless of caffeine percentage
• Consistent cup quality from 0% to 100% caffeine

Brewed Coffee Collection

Coffee drips into selected vessel:

• Glass carafe (Originara, Advancara option): Warming plate maintains 175-185°F
• Thermal carafe (Advancara option, Culminara): Vacuum insulation maintains temperature 2-4 hours without power
• Direct-to-cup (all models): User's mug/cup placed on platform

At this stage: Pure coffee with precise caffeine customization achieved. Additive dispensing occurs during this phase (see Phase 6).

Phase 6: In-Stream Pharmaceutical-Grade Additive Dispensing

CRITICAL DISTINCTION: In-Stream vs. Post-Brew Dispensing

CAFFEVOLVE employs IN-STREAM additive dispensing, meaning additives dispense INTO THE FLOWING COFFEE STREAM DURING ACTIVE BREWING, not after brewing completes. This timing is fundamental to the patent and provides superior integration.

Timing & Trigger System

Additive dispensing trigger point:

- Begins when coffee volume reaches 30-50% of target
- Typically occurs during Phase 5b (First Extraction)
- System monitors brew progress via flow sensor or timer
- Triggers at optimal moment for maximum integration

Example Timeline (12oz brew):

- 0:00-0:45 - Bloom phase (30% water = 3.6oz)
- 0:45-2:15 - First Extraction phase (40% water = 4.8oz)
  → At 1:30-1:45: Coffee volume reaches ~6oz (50% of 12oz target)
  → ADDITIVE DISPENSING TRIGGERS
  → Powder drops into flowing coffee stream
- 2:15-3:45 - Second Extraction phase (30% water = 3.6oz)
- 3:45-4:30 - Drawdown phase

User-Fillable Chamber Architecture

Modular cartridge system scales by model:

Originara:

- 6 user-fillable chambers
- Individual chamber capacity: ~50ml each
- User manually labels and fills chambers with preferred pharmaceutical-grade powder additives
- Open system supports any brand or source

Advancara:

- 8 user-fillable chambers
- Individual chamber capacity: ~75ml each
- Touchscreen interface for chamber labeling and dosage programming
- Enhanced capacity for heavier supplementation routines

Culminara:

• 12 user-fillable chambers
• Individual chamber capacity: ~100ml each
• Climate-controlled storage compartment (60-70°F, <50% humidity)
• Commercial-grade capacity for high-volume usage

User Control & Configuration

Users manage additive system through interface:

• Label each chamber position (e.g., 'L-theanine 100mg', 'Collagen 5g', 'Ashwagandha 300mg')
• Program dosage amount per chamber (system dispenses user-specified quantities)
• Enable/disable chambers for each brew
• Graduated markings on chambers assist with filling to appropriate levels
• System tracks approximate fill level based on dispensing history
• User-set refill alerts when chamber runs low

Environmental Protection

Chamber design preserves additive potency:

• Airtight seals on each chamber prevent moisture intrusion
• UV-protective housing prevents photodegradation
• Food-grade materials (BPA-free polymer or glass construction)
• Desiccant packet holders in chamber compartment
• Climate-controlled storage (Culminara only): Maintains optimal 60-70°F, <50% humidity

Pharmaceutical-Grade Micro-Auger Dispensing System

Each chamber has dedicated precision dispensing mechanism:

Auger Specifications:

• Precision screw conveyor in sealed chamber
• Pitch: 0.5-1.0mm for fine powder control
• Diameter: 3-5mm (varies by powder characteristics)
• Material: Food-grade stainless steel or FDA-approved polymer
• Motor: Stepper motor with micro-stepping capability
• Configuration: Each auger dedicated to single chamber (no cross-contamination)

Dispensing Control:

• Microprocessor controls stepper motor rotation
• Rotation speed adjustable based on powder flow characteristics
• Each chamber independently programmable
• Sequential or simultaneous dispensing (user-configurable)

Dual Load Cell Verification System

Pharmaceutical-grade accuracy through dual measurement:

Primary Measurement:

- Each chamber sits on precision load cell platform
- Pre-dispense weight recorded
- Real-time weight monitoring during dispensing
- Post-dispense weight recorded
- Dispensed amount calculated by weight difference

Secondary Verification:

- Receiving chamber (below auger outlet) also on load cell
- Confirms exact quantity received
- Cross-verification against primary measurement
- System alerts if measurements don't match within tolerance

Accuracy specification: ±5mg across typical dosage range (100mg-10g)

Example: 300mg Ashwagandha Powder Dispensing

User configuration: Chamber 3 labeled 'Ashwagandha 300mg', enabled for this brew

Dispensing sequence:

1. Pre-dispense weight: Chamber 3 reads 45.800g
2. Brew trigger: Coffee volume reaches 50% (6oz of 12oz target)
3. Auger activation: Stepper motor begins controlled rotation
4. Real-time monitoring:
   - 45.750g (50mg dispensed)
   - 45.650g (150mg dispensed)
   - 45.550g (250mg dispensed)
   - 45.500g (300mg dispensed) → MOTOR STOPS
5. Verification: Receiving chamber confirms 0.300g received
6. Accuracy achieved: ±5mg (±1.7% for this dose)
7. Total dispensing time: 3-5 seconds

Powder Delivery Method - In-Stream Integration

Precision funnel system delivers powder into flowing coffee:

Nozzle Positioning:

- Height: 6-8 inches above carafe/cup rim
- Alignment: Positioned to intersect falling coffee stream
- Angle: Direct vertical drop for maximum stream penetration

• Anti-static coating: Prevents powder adhesion to funnel walls
• Vibration assist (if needed): Brief 0.5-second pulse dislodges sticky powders

Integration Mechanism:

When powder drops from nozzle:

1. Powder enters falling coffee stream mid-flight
2. Kinetic energy of falling liquid carries powder downward
3. Natural turbulence created by 6-8 inch drop disperses powder
4. Powder integrates throughout coffee volume during descent
5. Additional mixing occurs as coffee enters carafe/cup

Critical Advantage of In-Stream Dispensing

By dispensing into the flowing stream DURING brewing (rather than onto finished coffee), additives achieve:

• Superior integration through natural turbulence
• Kinetic energy of falling liquid provides mixing action
• No additional mechanical stirring required
• Improved dissolution rates due to active flow
• More uniform distribution throughout beverage
• Enhanced bioavailability through better particle suspension

Integration & Mixing Systems

Method 1 - Flow Dynamics Integration (Primary):

• Falling coffee stream creates natural turbulence
• 6-8 inch drop height generates sufficient kinetic energy
• Powder carried downward and distributed throughout liquid
• Turbulent mixing zones at carafe/cup entry point
• Natural convection currents from temperature differential

Method 2 - Baffled Carafe Design (Passive Assist):

• Carafe features internal spiral baffles (Advancara/Culminara)
• Flow-directing geometry creates turbulent mixing zones
• Coffee follows helical path during filling
• Three-level helical baffle system promotes uniform distribution
• Complete integration achieved during 4-5 minute brew cycle
• No moving parts—entirely passive mixing enhancement

Method 3 - Post-Brew Vibration (Optional):

• After brewing completes, optional vibration activates
• Low-frequency vibration (50-100Hz) for 5-15 seconds

• Ensures residual powder particles fully dissolve
• Particularly effective for cohesive powders (protein, collagen)
• User-selectable feature

Method 4 - Ultrasonic Mixing (Culminara Premium Feature):

• 40kHz ultrasonic pulse (beyond human hearing)
• Duration: 2-3 seconds post-brewing
• Low intensity avoids heating or flavor alteration
• Cavitation bubbles create micro-turbulence at particle surfaces
• Dramatically accelerates dissolution of:
  - Collagen peptides
  - Protein powders
  - Fibrous botanical extracts (mushrooms, adaptogens)
• Improved bioavailability through smaller particle dispersion

Supported Additive Types

CAFFEVOLVE's pharmaceutical-grade dispensing system supports wide range of powder supplements:

Cognitive & Energy:

• L-Theanine: 50-200mg doses, fine crystalline powder, highly soluble
• Caffeine powder: 25-100mg doses (for additional boost beyond beans)
• Lion's Mane mushroom: 500-1000mg doses, fine powder, mild flavor

Wellness & Recovery:

• Collagen peptides: 5-10g doses, fine powder, neutral flavor
• Protein powder: 10-30g doses, fine to medium, various flavors
• Ashwagandha: 300-600mg doses, fine to medium powder, earthy flavor
• Reishi/Chaga mushrooms: 500-1500mg doses, fine powder, bitter flavor

Performance & Nutrition:

• MCT powder: 5-10g doses, creamy powder, fat-soluble
• Creatine: 3-5g doses, fine crystalline powder
• Vitamin complexes: Variable doses, powder form

Safety & Verification Systems

Multiple layers of safety ensure proper operation:

• Optical sensor confirms powder drop into cup/carafe
• Weight verification via dual load cells confirms dispensing accuracy
• Cup/carafe presence sensor prevents dispensing if vessel removed
• Drip tray overflow sensor halts operation if spill detected

• User-programmable dosage limits enforce maximum daily amounts per chamber
• Chamber empty detection via load cell alerts user when refill needed
• System logs all dispensing events for user review (Culminara)

Phase 7: Final Delivery & System Reset

Beverage Completion

Final beverage characteristics:

• Temperature: Delivered at optimal drinking temperature (160-170°F)
• Visual quality: Completely homogeneous appearance, no powder residue visible
• Additive integration: Supplements blend seamlessly, no separation or settling
• Aroma: No chemical odor from additives, coffee aromatics preserved

Temperature maintenance by model:

• Glass carafe models: Warming plate maintains 175-185°F continuously
• Thermal carafe models: Vacuum insulation retains heat 2-4 hours without power
• Single-cup brewing: Coffee ready immediately in user's mug at drinking temperature

User Notification System

Brew completion signals:

• Audible chime (adjustable volume or mute)
• Visual display confirmation:
  - Originara: LED indicator changes color (brewing → ready)
  - Advancara/Culminara: Touchscreen displays completion message
• Customization summary displayed:
  Example: 'Your 12oz, 60% caffeine + 100mg L-theanine coffee is ready'
• System confirms all cycles completed successfully

Automatic Cleaning & Purge Cycle

Step 1 - Additive Pathway Purge:

• Brief air pulse (1-2 seconds) through each dispensing funnel
• Clears residual powder from auger chamber and delivery tube
• Prevents cross-contamination between different additives
• Residue directed to drip tray for easy cleanup
• Ensures fresh, clean dispensing for next brew

Step 2 - Grinder Chamber Purge:

• Brief burst of air or mechanical sweep clears residual grounds
• Ensures zero coffee retention between different caffeine blends
• Critical for accurate customization on subsequent brews
• Prevents flavor contamination between different coffee blends
• Maintains grinder calibration accuracy

Step 3 - System Diagnostics:

• Self-check of all sensors and mechanisms
• Load cells re-zero for next dispensing cycle
• Confirms all chambers properly seated
• Verifies gate valves returned to closed position
• Checks water level, bean levels
• Logs any errors or maintenance needs (Culminara)

Step 4 - System Ready State:

• All components return to standby mode
• Display shows: 'Ready for next brew'
• Status check performed:
  - Bean hoppers: Level indicators updated
  - Additive chambers: Fill level estimates updated
  - Water reservoir: Level verified
• User alerted if any refills needed
• Energy-saving mode activated after 15 minutes idle (screen dims, heating reduces)

Total Process Time Summary

Single 12oz cup brewing timeline:

• Bean dispensing (gravimetric): 10-15 seconds
• Active bean blending (agitator arm): 2-3 seconds
• Grinding: 12-20 seconds
• Brewing with in-stream additive dispensing: 4-5 minutes
  - Bloom: 30-45 seconds
  - First Extraction + Additive dispensing: 60-90 seconds
  - Second Extraction: 60-90 seconds
  - Drawdown: 30-60 seconds
• Additive dispensing duration: 3-5 seconds (concurrent with brewing)
• Optional post-brew mixing: 5-15 seconds (Originara vibration, Culminara ultrasonic)
• Purge & reset: 5 seconds
• TOTAL: 5-7 minutes

Full 60oz carafe brewing timeline:

• Bean dispensing (gravimetric): 15-20 seconds
• Active bean blending (agitator arm): 2-3 seconds

• Grinding: 20-25 seconds
• Brewing with in-stream additive dispensing: 8-10 minutes
• Purge & reset: 5 seconds
• TOTAL: 10-12 minutes

Daily-Fresh Water Reservoir System

The CAFFEVOLVE™ system incorporates a right-sized water reservoir specifically designed to optimize water freshness for same-day consumption, thereby enhancing coffee flavor quality while maintaining user convenience. Reservoir capacity is scaled by model to support the full range of scalable brewing (8-40 oz on consumer models, 8-60 oz + custom on commercial).

Optimized Capacity by Model

Reservoir capacity is sized to support scalable brewing while encouraging daily water replacement:
• Originara ($199): 40-50 oz reservoir - supports 8-40 oz scalable brewing
• Advancara ($599): 50-60 oz reservoir - supports 8-40 oz scalable brewing with margin
• Culminara ($2,499+ COMMERCIAL): 80-96 oz reservoir - supports 60 oz carafe capacity plus custom sizes

Daily Refresh Philosophy

The reservoir capacity is intentionally calibrated to encourage daily water replacement, ensuring that water used for brewing is consistently fresh (less than 24 hours old). This approach prioritizes flavor quality and health safety over the convenience of multi-day water storage found in conventional coffee makers.

Water Quality Optimization Window

The system is specifically designed for a 24-hour water quality window, after which water quality begins to degrade due to:
• Loss of dissolved oxygen content (affecting flavor extraction)
• Potential bacterial growth (health and taste concerns)
• Temperature equilibration with ambient conditions (affecting heating efficiency)
• Accumulation of off-flavors from prolonged exposure to reservoir materials

Reservoir Design Features

Visual User Guidance:
• Graduated markings for brew sizes (8, 12, 16, 20, 40 oz)
• Fill lines corresponding to number of brews
• Optional time-since-fill indicator on control interface

Removable Design:
• Tool-free removal for easy daily cleaning and refilling
• Encourages healthy maintenance habits and reduces bacterial growth

Material Specifications

• Construction: BPA-free, food-grade polymer (Tritan copolyester or equivalent)
• Antimicrobial coating: Silver-ion or copper-ion embedded surface treatment
• Transparency: Clear or translucent design for visual water level verification
• Insulation: Optional double-wall construction to maintain water temperature

Sensor Integration

• Water level sensor (capacitive or optical) for pre-brew verification
• Low-water alert system prevents brewing with insufficient water
• Optional: Time-since-fill tracking via control system timestamp
• Optional: Water quality sensors (dissolved oxygen, temperature, conductivity)

Functional Advantages Over Prior Art

Unlike conventional coffee makers that use large reservoirs requiring refilling only every few days:

Superior Flavor Quality:
• Dissolved Oxygen Preservation: Water refreshed daily maintains higher dissolved oxygen levels (typically 8-10 mg/L in fresh tap water vs. 4-6 mg/L after 48 hours of storage)
• Elimination of Stale Water Taste: Daily water replacement prevents the development of off-flavors
• Temperature Consistency: Fresh cold water provides consistent starting temperatures (50-60°F)
• Mineral Stability: Fresh water maintains consistent mineral content and pH for optimal extraction

Health and Safety Benefits:
• Bacterial Growth Prevention: Daily refresh cycle minimizes time window for bacterial colonization
• Biofilm Reduction: Shorter exposure time reduces biofilm formation on reservoir surfaces
• Reduced Cleaning Chemical Exposure: More frequent water changes mean less need for aggressive descaling

Complete Brewing Example: Timeline

Scenario: 12oz coffee, 60% caffeine, with 100mg L-theanine powder

User Inputs:

• Model: Advancara
• Caffeine: 60% (slider selection)
• Volume: 12oz
• Strength: Medium-Bold (18g coffee per 12oz)
• Additives: L-theanine chamber enabled, 100mg dose
• Grind: Medium

System Calculations:

• Total beans needed: 18g
• Hopper A (regular): 10.8g (60%)
• Hopper B (decaf): 7.2g (40%)
• Total water: 12oz (355ml)
• L-theanine dose: 100mg (0.1g)

Phase-by-Phase Timeline:

0:00 - PHASE 1: User confirms selection, presses 'Brew'

0:01 - PHASE 2: Gravimetric bean dispensing begins

• Both gate valves open simultaneously
• Beans flow by gravity into blending chamber
• Hopper A dispenses 10.8g in 8 seconds
• Hopper B dispenses 7.2g in 6 seconds
• Both valves close when targets reached
• 0:15 - Dispensing complete

0:15 - PHASE 3: Active bean blending

• Reciprocating agitator arm activates
• 6 sweep cycles through 180° arc
• Regular and decaf beans thoroughly mixed
• 0:18 - Blending complete, arm retracts
• Blended beans drop into grinder

0:18 - PHASE 4: Precision grinding

• Burr grinder activates at 900 RPM (medium grind)
• 18g beans ground for 14 seconds
• Particle-level homogeneity achieved
• Grounds fall into drip basket
• 0:32 - Grinding complete

0:32 - PHASE 5: Multi-phase brewing begins

0:32-1:17 - Phase 5a: Bloom

• Water heats to 202°F
• 30% of water (3.6oz) delivered through shower head
• Grounds bloom and release CO_2
• 45-second pause for degassing

1:17-2:47 - Phase 5b: First Extraction

• 40% of water (4.8oz) delivered at 1.8 oz/min flow rate
• Coffee begins dripping into carafe
• At 2:00: Coffee volume reaches 6oz (50% of target)

2:00 - PHASE 6: In-stream additive dispensing triggers

• L-theanine chamber auger activates
• Chamber load cell: 28.500g → 28.450g → 28.400g → STOP
• 100mg (0.100g) dispensed in 3 seconds
• Powder drops through funnel into flowing coffee stream
• Natural turbulence integrates L-theanine during fall
• 2:03 - Additive dispensing complete, extraction continues

2:47-4:17 - Phase 5c: Second Extraction

• Remaining 30% of water (3.6oz) delivered
• Extraction completes
• Coffee continues dripping with additives fully integrated

4:17-4:47 - Phase 5d: Drawdown

• No new water added
• Final liquid drains through grounds
• Drip rate slows to stop
• 4:47 - Brewing complete, 12oz coffee in carafe

4:47 - PHASE 7: System reset

• Additive pathway purge (2 seconds)
• Grinder purge (2 seconds)
• Load cells re-zero
• System diagnostics complete
• 4:52 - Display shows: 'Your 12oz, 60% caffeine + 100mg L-theanine coffee is ready'
• Audible chime
• Ready for next brew

Final Product Quality:

• 12oz custom coffee with precisely 60% of normal caffeine content
• 100mg pharmaceutical-grade L-theanine fully dissolved and integrated
• Freshly brewed with pharmaceutical precision
• Temperature: 165°F (optimal drinking temperature)
• Visual: Completely homogeneous, zero powder residue
• Aroma: Pure coffee, no chemical notes
• Ready to drink immediately

Total elapsed time: 4 minutes 52 seconds

The CAFFEVOLVE Advantage

The integrated seven-phase blend-then-grind-then-brew-then-enhance process delivers unprecedented coffee customization with pharmaceutical precision:

Precision Caffeine Control

• Gravimetric dispensing provides ±0.1g bean accuracy across 0-100% caffeine range
• Active reciprocating agitator arm ensures particle-level homogeneity
• Blend-then-grind methodology impossible to achieve with pre-ground mixing
• Consistent extraction chemistry regardless of caffeine percentage
• Maximum freshness via grind-on-demand for each custom blend

Pharmaceutical-Grade Supplement Delivery

• Dual load cell verification provides ±5mg dosing accuracy
• In-stream dispensing during brewing leverages natural turbulence for superior integration
• No additional mechanical stirring required
• Enhanced bioavailability through improved dissolution
• User-fillable chambers eliminate proprietary lock-in and reduce cost

Superior Technical Design

• Gravimetric bean dispensing: More accurate, simpler, more cost-effective than auger-based systems
• Standardized active blending: Reciprocating agitator arm identical across all models ensures consistent quality
• Zero-retention architecture: No cross-contamination between different caffeine blends or additive combinations
• PID temperature control: ±2°F precision throughout brewing cycle
• Multi-phase extraction: Optimized bloom, extraction, and drawdown for maximum flavor

Flexible Application

• Three-tier product strategy addresses consumer ($199) to commercial ($2,499+) markets
• Single-cup or carafe brewing on all models
• Progressive carafe configuration: Glass with warming plate → Customer choice → Thermal only
• Scalable capacity and features while maintaining core technology
• Asset-light IP licensing model for rapid market penetration

User Benefits

• Complete customization for any time of day, any desired wellness effect
• Repeatable precision through automated load cell verification
• Cost-effective operation with user-supplied additives (no proprietary cartridges)
• Extended supplement shelf life with stable powder formulations
• Preserved bioavailability by adding heat-sensitive compounds during (not before) brewing
• Easy operation with saved user profiles and one-touch presets

"Coffee Without a Curfew"

Perfectly tailored caffeine and pharmaceutical-grade wellness supplementation in every freshly brewed cup.

For licensing inquiries:
Brent Langevin, Founder
(571) 464-9451

Caffevolve Corporation
Kenosha, Wisconsin