Santa's Workshop Automation

Game Design Document (GDD) – Complete Edition

Version 1.0 • November 01, 2025

Table of Contents

1. Core Player Goals & Progression

Objective: Build and optimize Santa's automated workshop to produce high-quality toys before each Christmas. Quantity, complexity, and efficiency contribute to the *Christmas Spirit Score* that defines seasonal success.

Seasonal Cycle

– In■game year: January → December. Time can be paused or run at 1×/2×/3×.
– Christmas Rush (Nov–Dec): increased demand and stress testing of systems; unique music layer and UI flair.
– Christmas Eve (23:59): production halts; summary report with toy counts, grades, delivery rate, energy efficiency, and Spirit Score.
– Carryover: Factory layout, research, unlocks, and cosmetics persist into the next year.

Mission-Based Hybrid Structure

– Campaign missions onboard the player while unlocking systems (tutorial → mastery).
– Post-campaign Sandbox mode continues infinitely with optional challenges and contracts.
– No hard fail; underperformance yields coaching dialogue and softer goals next year.

Example Mission Arc

• The First Conveyor – build a basic line and deliver first gifts.
• Power Problems – introduce generators, grid, and brownout management.
• A Wrapping Worry – packaging automation and quality grading.
• Santa's Quality Standards – S/A/B/C grades, rework loops, inspection.
• The Great Christmas Rush – achieve quota under time pressure.
• New Year, New Toys – unlock Tier II chains and research branches.

2. Progression & Research

Design Principle: Branching, open■ended tech allowing specialization and replayability. Research Points (RP) are generated via production, missions, and labs, and are spent on nodes within themed branches.

Branches

– **Automation & Machinery**: Conveyors, inserters, splitters, smart routing, assemblers tiers.
– **Energy & Power**: Fuel → electric → renewable → aurora magic; storage and grid optimization.
– **Materials & Refinement**: Smelting, plastics, textiles, glass; composite materials later.
– **Toy Innovation**: Unlocks toy tiers and specialty machines/blueprints.
– **Logistics & Delivery**: Warehouses, drones, teleport belts, dispatch optimizations.
– **Elf Management & Research**: RP rate, queues, specialists, lab upgrades.
– **Magical Integration**: Overclocking, enchanted machines, spirit conduits.
– **Festive & Aesthetic**: Cosmetics, cheer auras, minor efficiency buffs.

Synergy Nodes

• Aurora Generator (Energy + Magic): clean late■game power unlocked by cross■branch progress.
• Enchanted Assemblers (Automation + Magic): temporary overclock and reduced defect rate.
• Gift Drone Network (Logistics + Toy Innovation): automated delivery prioritization.

Progression Curve

• Phase 1 – Manual Production
• Phase 2 – Early Automation
• Phase 3 – Industrial Growth
• Phase 4 – Magical Integration
• Phase 5 – Optimization & Prestige

3. Resource & Production System

Core Loop: Extract → Process → Assemble → Package → Deliver. Resources are infinite; extraction efficiency scales with research and technology. Space, power, and logistics are the constraints.

Resource Categories

– Raw: Wood, Stone, Iron Ore, Coal, Crude Plastic.
– Refined: Metal Ingot, Plank, Plastic Sheet, Glass.
– Components: Gear, Wheel, Cloth, Circuit Board, Spring.
– Toy Parts: Doll Head, Train Chassis, RC Frame, Plush Body.
– Magical: Aurora Essence, Stardust, Christmas Spirit.
– Energy: Electricity, Magic Power (aurora conduits).

Factory Systems

– Transport: conveyors (solid), pipes (liquid), carts/rails (mid), magic conveyors (late).
– Storage: crates → depots → warehouses; smart IO rules and filters.
– Power: generators (fuel), turbines (wind), aurora reactors (magic); batteries and load shedding.
– Quality & Grading: speed, material grade, energy efficiency, magic infusion → S/A/B/C grade output.

Example Pipeline – Toy Train

• Iron Ore → Smelter → Iron Ingot
• Wood → Sawmill → Plank
• Ingot + Plank → Press/Workshop → Chassis & Wheels
• Chassis + Wheels + Paint → Assembler → Toy Train
• Toy Train → Wrapping Station → Wrapped Gift → Dispatch

4. Narrative & Worldbuilding

Premise: Elves push for modernization to meet global demand. Santa leads a respectful fusion of tradition and technology. Tone is warm, humorous, and encouraging.

Setting & Regions

– Central Workshop – cozy timber core with glowing windows.

– Industrial Outskirts – smokestacks, rails, cranes; still festive.
– Research Hills – cabins with telescopes and labs.
– Aurora Fields – open plains with dancing lights; magic harvest sites.

Cast

• Santa – benevolent leader; sets quotas and celebrates wins.
• Tinka (Chief Engineer) – enthusiastic tutorial guide and R&D; voice.
• Bramble (Union Leader) – comic foil, tradition advocate.
• Eira (Spirit Keeper) – steward of magic and balance.
• Rudolph AI – mission/logistics assistant with witty quips.

Story Beats (Acts)

• Act I – The First Conveyor
• Act II – Powering the North Pole
• Act III – Magic Integration
• Act IV – The Great Christmas Rush
• Act V – A New Year's Workshop

5. Technical Design

Engine: Unity 2022+ LTS (URP). PC■first. C# OOP with ECS/Jobs for hot simulation paths. Fixed simulation tick (10–20 Hz) decoupled from render.

Architecture Layers

– Render Layer – visuals, lighting, particles, animation.
– Simulation Layer – machines, power, logistics, recipes, world state.
– UI Layer – UI Toolkit/Elements; async reads from sim snapshots.

Core Systems

• Resource Manager and Recipe Graph
• Machine Framework (BaseMachine with I/O slots, states, work cycles)
• Power Grid (nodes/edges, load, brownout handling)
• Logistics (belts, inserters, routing; object pooling and culling)
• Research/Missions (event bus, data-driven via ScriptableObjects)
• Save/Load (chunked, versioned, JSON+binary hybrid)

Performance Strategy

– Chunking and spatial partitioning; update only visible/nearby chunks.
– Burst + Jobs for conveyor/item updates; pooled visuals for belt items.
– LOD, GPU instancing, lightmap baking where feasible.

6. Monetization & Retention

Premium single■purchase (£25–£35). No microtransactions. Long■term value via expansions and free QoL updates.

Currencies & Rewards

– Christmas Spirit – earned by deliveries and grades; fuels global boosts.
– Workshop Points – mission rewards; cosmetics/QoL unlocks.
– Aurora Shards – prestige currency for late■game meta upgrades.

Retention Loops

• Seasonal cycle with end■of■year report and score chasing.
• Prestige resets that preserve key unlocks; new map seeds.
• Blueprint sharing and beauty/efficiency leaderboards (cosmetic only).

7. Production Plan

Team: 8–12 core; 14–18 months to 1.0. Milestone■driven with risk management and performance gates.

Milestones (Indicative)

• M0–1 Pre■production: GDD/TDD/Art Bible, tech choices, CI setup.
• M2–3 Prototype: grid, placement, belts, base machines, save stub.
• M4–5 Vertical Slice: polished chain, power v1, research v1, mission v1.
• M6–9 Alpha: packaging, logistics upgrades, research web, summary screen.
• M10–12 Beta: Tier III toys, magic v1, tutorials, external playtests.
• M13–14 RC: polish, accessibility, perf passes, feature freeze.
• M15+ Launch & Live: hotfixes, roadmap QoL, DLC pre■prod.

Risks & Mitigations

– Simulation performance – ECS/Jobs, pooling, chunk updates.
– Save integrity – versioned schema, migrations, autosave backups.
– Scope creep – VS must■ship list, MoSCoW gates, change control.
– UI complexity – UX wireframes, progressive disclosure, user tests.

8. UI / UX & Controls

Philosophy: Storybook workbench aesthetic, clarity over clutter, cozy feedback, progressive disclosure.

Primary UI Panels

• Build Menu (tabs + search + hotbar)
• Inspector (I/O rates, power, grade, utilization)
• Research Web (branch colors, tooltips, node timers)
• Mission Board (card list with elf portraits, rewards)
• Reports (graphs, grades, Santa narration)
• Toypedia (recipes, filters, favorites)
• Overlay Toggles (power, logistics, efficiency heatmap)

Controls (PC)

– WASD/middle■drag pan, wheel zoom, R/Shift+R rotate, LMB place, RMB cancel.
– Blueprint: B/Ctrl+B; overlays: F1–F4; speed: 1/2/3/Pause; screenshot: F12.
– Accessibility: remap keys, UI scale 75–150%, colorblind palettes, tooltip delay.

UX Flows

• Placement ghost with valid/invalid tint and IO arrows; click feedback with chime and snow puff.
• Research start with parchment animation; completion sparkle and unlock toast.
• End■of■year book UI, animated charts, Continue/Prestige options.

9. Content Specification

Core Resources

– Wood, Stone, Iron Ore, Coal, Crude Plastic → Plank, Metal Ingot, Plastic Sheet, Glass → Gear, Wheel, Cloth, Circuit Board, Spring → Toy Parts → Final Toys.
– Magical: Aurora Essence, Stardust (late■game), Christmas Spirit (meta).

Key Buildings

• Extractors: Tree Harvester, Quarry, Coal Extractor, Polymer Extractor.
• Processors: Sawmill, Smelter, Press, Glassmaker, Dyer/Paint Shop.
• Assemblers: Toy Assembler, Electronics Bench, Gear Workshop, Plush Maker.
• Packaging & Logistics: Wrapping Station, Warehouse, Conveyor/Inserter, Magic Conveyor.
• Energy: Power Generator, Wind Turbine, Battery, Aurora Reactor.
• Utility: Research Cabin, Mission Board, Dispatch Center.

Toy Chains (Examples)

– Tier I: Wooden Block / Pull Cart / Wooden Train.
– Tier II: Wind■up Mouse / Jack■in■the■Box / Toy Robot.
– Tier III: RC Car / Plush Drone / Musical Snowglobe.
– Tier IV: Floating Sleigh / Enchanted Doll / Sparkle Train.
– Tier V: Singing Tree / Self■Wrapping Present / AI Reindeer Drone.

Research Nodes (Samples)

• Conveyor Belts → Splitters/Sorters → Smart Routing
• Coal Generator → Wind Turbine → Battery Grid → Aurora Reactor
• Plastic Extraction → Press Molding → Electronics Bench → Microcircuits
• Magical Studies I → Stardust Refinement → Aurora Infusion (Overclocking)
• Specialist Elves → Multi■Queue Research → Lab Automation

Balancing Targets

– Throughput: 1 item/s (early) → 10+/s (late).
– Power: each tier +50–75% demand; batteries smooth spikes.
– Research pacing: 2–4 min early nodes, 5–8 min mid, 10+ min late.
– Optimization rewards: up to ~20% global efficiency via synergy.

10. Art & Audio Direction

Visual identity: realistic isometric with Nordic festive styling. Warm interiors vs. cold exteriors; aurora accent colors.

Environment & Buildings

• Snowfall, ambient fog, volumetric light shafts; adjustable FX quality.
• Building evolution: wood → metal → enchanted hybrids; readable silhouettes.
• Decor trims: holly, wreaths, candy■cane striping; never compromise readability.

UI Art & Motion

– Parchment panels, brass frames, ribbon tabs; serif headers + clean sans data font.
– Hover shimmer, page■flip transitions, gentle animations under 300 ms.

Audio Palette

• Soundtrack: orchestral with celesta/bells; adaptive layers (calm → rush).
• Machines: soft whirr, paper rustle, gear clinks; no harsh loops.
• Magic: glassy shimmers and airy tones blending with orchestra.
• VO: short, charming stingers from Santa, Tinka, Bramble, Eira.

11. Post■Launch & Expansion Planning

Post■launch cadence: hotfixes and QoL, then seasonal expansions. No microtransactions; premium DLC and cosmetic packs only.

Planned Expansions

• The Easter Exchange – egg painting, chocolate processing, spring biome.
• Summer Innovations – solar energy, glass chain, bright palette.
• Halloween Hijinks – glow essence, spooky toys, autumn tint.
• Global Gift Network – airships, shipping routes, co■op prototype.

Events & Community

– Elf Appreciation Week, Aurora Surge, Great Gift Rush (December live event), New Year Blueprint Contest.
– Blueprint sharing (Steam Workshop or share codes), Mod SDK (machines, recipes, UI skins, missions).

KPIs & Vision

- Steam ≥85%, D30 >25%, session 45–90 min, DLC attach 20–30%.
- Year 1: strong single■player + modding; Year 2: cross■holiday expansions; Year 3+: living festive industrial universe.

- Steam ≥85%, D30 >25%, session 45–90 min, DLC attach 20–30%.
- Year 1: strong single■player + modding; Year 2: cross■holiday expansions; Year 3+: living festive industrial universe.

Appendix A – Glossary

• Christmas Spirit Score – Season rating influenced by quantity, quality, and efficiency.

• RP (Research Points) – Currency generated by production and labs for tech unlocks.

• Synergy Node – Cross■branch tech unlocked by combined progress.

• Prestige – Optional reset retaining meta■upgrades for replayability.

End of Document