

# GNC Machine Shop Production System

## Operational Blueprint + Implementation Timeline

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### Executive Objective

Build a lightweight, revision-safe production system that:

- Tracks pallets as the primary manufacturing unit
- Uses a web portal as the single source of truth
- Eliminates accounting-system clutter
- Provides real-time shop visibility
- Enables revision control without operational friction
- Feeds purchasing automatically

#### Design Philosophy:

Simple > Clever

Traceable > Automated

Operator-friendly > Engineer-friendly

(Engineers survive confusion. Operators do not.)

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## System Architecture (High-Level)

### Source of Truth

#### 👉 Web Portal

Contains:

- Engineering knowledge base
- Job definitions
- Pallet records (JSON containers)
- Drawings + CNC programs
- Station instructions
- Consumable logs
- Purchasing dashboard

Paper travelers exist only as a **shop-floor convenience**, not as data authority.

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# Core Data Model (This is the secret sauce)

## 1. Engineer Master Record (Frame-Level)

Each frame part number generates a **Master Job Definition** containing:

- Nested cut sheet PDF (parsed)
- MPF / G-code
- Brake drawings + instructions
- Weld drawings + instructions
- Robot weld programs (optional but preferred)
- Revision metadata
- Material type
- Sheet yield

Think of this as:

FRAME\_MASTER.json

Not physically used on the floor — it feeds pallet creation.

## 2. Pallet Container (Primary Production Object)

Every pallet gets its own JSON:

PALLET-2026-000123.json

Contains:

- Frame part number
- Revision
- Source cut sheet
- Expected quantities
- Actual quantities
- Scrap
- Irregularities
- Current station
- History log
- Material consumption
- Linked documentation

### Why this is powerful:

You can run **Revision B and Revision D simultaneously** without chaos.

Most shops cannot do this without lighting themselves on fire.

# Engineering Workflow

## Step 1 — Engineer Upload

Engineer enters the portal and:

1. Uploads nested cut sheet PDF  
→ Parser extracts part list.
2. Uploads:
  - Laser / waterjet program
  - Brake drawings
  - Weld drawings
  - Robot programs
  - Station instructions
3. System generates **Frame Master Record**

No production job exists until this step is clean.

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# Production Workflow

## 1. Production Manager

Uses portal to:

- Select frame
- Order by sheet yield multiples
- Generate work order batch
- Push job into laser queue
- Reorder queue if needed

Laser becomes the **production pacemaker**.

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## 2. Laser Operator

Machine is largely automated.

Operator responsibilities:

- Load material
- Unload cut parts
- Cut skeleton → scrap
- Edge sand parts
- Evaluate **cut quality**
- Log scrap / irregularities via QR

System generates pallets automatically based on sheet runs.

### **3. Staging Model**

Every station gets a staging area.

Rules:

If nobody says otherwise — run the next pallet.

No meetings required. Beautiful.

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### **4. Brake Press**

Operator scans pallet QR → sees:

- Bin drawings
- Instructions
- Quantities

Logs:

- Completed bends
- Issues
- Deviations

(Manual entry for now is fine. Do not over-automate early.)

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### **5. Welding**

Two weld paths supported.

Queue is physical + mirrored digitally.

After welding:

👉 Pallet converts to **Full Frame Inventory Event**

Hand-off to assembly.

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# **Traveler Strategy (Excellent call, by the way)**

Traveler contains:

- QR code
- Job summary
- Instructions

But scanning opens the **live portal page**, ensuring drawings are never outdated.

Paper is guidance.

Portal is truth.

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## **Raw Materials Tracking**

Track only:

- 10ga stainless
- 12ga stainless
- 16ga stainless
- $\frac{1}{2}$ " mild steel

Material usage attaches automatically to pallet completion.

No ERP pollution required.

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## **Consumables Tracking (Often ignored — big mistake)**

Each station logs daily usage:

Examples:

- Laser nozzles
- Assist gas
- Brake tooling wear
- Weld wire
- Tips
- Diffusers

Feeds directly into Purchasing.

## Purchasing Dashboard

Purchasing sees:

- Burn rate
- Stock risk
- Reorder signals

Instead of panic-buying on Fridays.

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## Shop Dashboard

Real-time visibility:

- Active pallets
- Station queues
- Scrap trends
- Cut quality flags
- Output rate
- Material consumption

Your shop foreman will start checking this instead of wandering around guessing.

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## Automation Opportunities (Phase 2+)

Do NOT start here.

Later integrate:

- Brake counters
- Robot part counts
- Laser runtime data
- Lantek SQL pull

Manual first.

Reliable second.

Automated third.

# Implementation Timeline

(Realistic. Aggressive. Achievable.)

## Week 1–2 — Architecture Lock

- Finalize data model
- Define JSON schema
- Map station fields
- Confirm engineer upload workflow

**Critical milestone:**

No scope creep.

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## Week 3–6 — Portal Build (MVP)

Must include:

- Engineer upload
- Pallet creation
- QR generation
- Job viewer
- Operator logging
- Dashboard (basic)

Skip pretty UI.

Pretty is how projects die.

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## Week 7–8 — Shop Pilot

Run ONE frame through system.

Expect friction.

Friction is truth revealing itself.

Adjust.

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## Week 9–10 — Expand

- Add welding flow
  - Add purchasing dashboard
  - Add consumables
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## Month 3 — Stabilization

Now consider:

- Lantek integration
- Machine data
- Auto nesting pulls

Not before.

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## Major Risk Areas (Read This Twice)

### ⚠ Over-engineering early

Don't.

### ⚠ Automating before workflow is proven

Classic mistake.

### ⚠ Letting engineers dictate operator UX

Absolutely not.

Operators win.