Slide 1 – Title

Team Name	POWERHOUSE 2.0
Idea / Project Title	MATASSIST AI: GenAI Material Selection Assistant: Using LLM, RAG
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Slide 2 – Problem

- **What problem are you solving?**

PROBLEM: **The Material Selection Challenge in Engineering**

PROBLEM STATEMENT: **Selecting the right material** is a critical early step in any design project, often requiring **deep domain expertise** and familiarity with standards like **ASTM, DIN, EN, and ISO**. However, organizations frequently lack specialists for every application area - such as **cryogenics, mining, oil & gas, subsea, hygienic, and power systems.** This gap leads to missed opportunities during bid processes and delays in product development. **Engineers must manually analyze large datasets** to identify materials that meet **performance, cost, availability,** and s**ustainability criteria,** which is both **time-consuming and resource-intensive**.

Engineers spend **40-60%** of project time **manually searching** through **material standards (ASTM, ISO, DIN etc.**) Material selection involves comparing hundreds of properties across multiple standards, **Traditional methods** lead to **suboptimal choices, project delays**, and **increased costs,** Critical decisions made without predictive insights on material performance

- **Who is affected?**

PRIMARY LEVEL:
- Mechanical Engineers & Design Teams

SECONDARY LEVEL:
- Manufacturing Companies & R&D Departments

SECONDARY SUB-LEVEL:
- Material Scientists & Quality Control Teams

TERTIARY LEVEL:
- Students & Academic Researchers

Slide 3 – Your Solution

- **What is your idea?**

Our Idea In Simple Terms: GenAI-Powered Material Intelligence Platform

Key Description: An AI-driven assistant that instantly recommends optimal materials by analyzing engineering standards and application requirements through conversational AI.

Key Features:

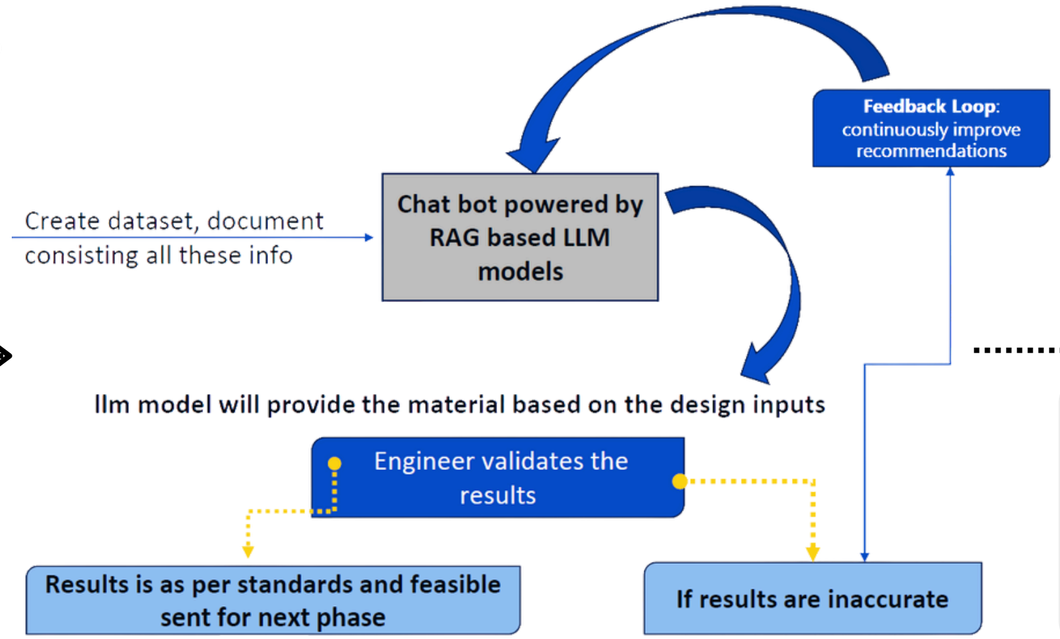
GenAI + RAG Engine:
Uses **LangChain + LLM** (OpenAI / Llama-3) with FAISS/Chroma vector DB for **semantic retrieval** from standards and internal datasets.

Domain-Aware Intelligence:
Built-in filters for **Cryogenic, Oil & Gas, Subsea,** Automotive, Mining, Food-grade application materials with Suggestion prescribed by **Gemini 1.5 Flash** with **Fine-tuning model**

AI-Powered Material Ranking:
Assist, Rank and **Recommend Top materials** based on given **requirements, applications, inputs** via **AI-Powered Engine**

- **How does it solve the problem?**

- User uploads Document (PDF, W, X)
- User enter input requirements
  - Temperature range
  - Pressure level
- User enter input requirements
  - Tensile & Yield strength
  - Hardness
- User enter Standard Preferences
  - ASTM
  - ISO
  - EN
  - DIN



AI Material Ranking

- 10+ properties
- Rank Scoring
- Interactive Dashboards

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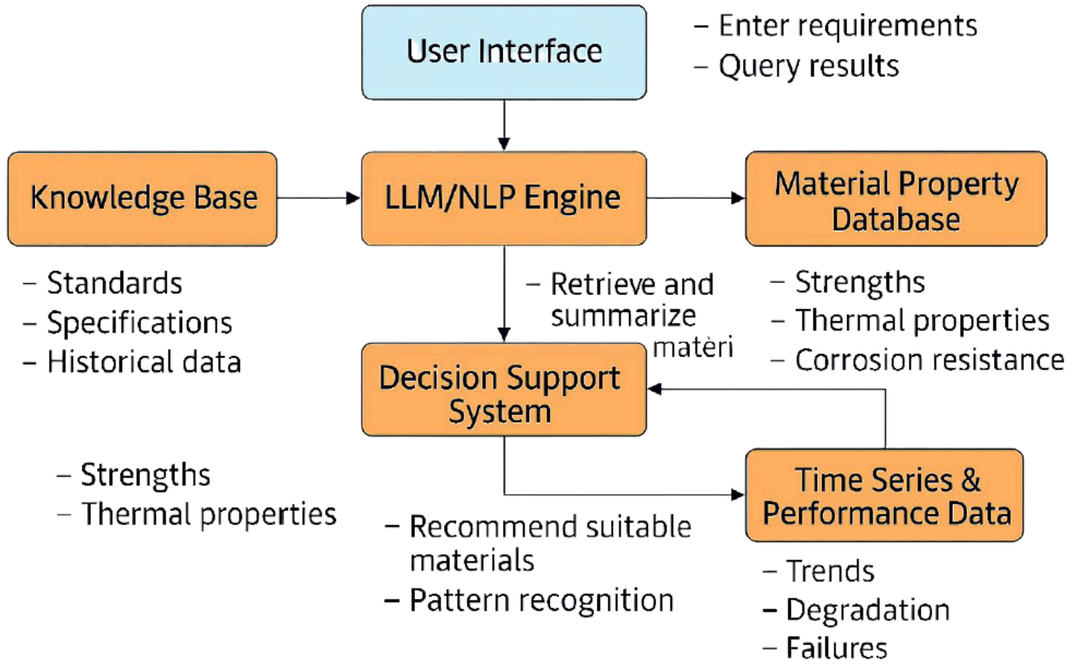
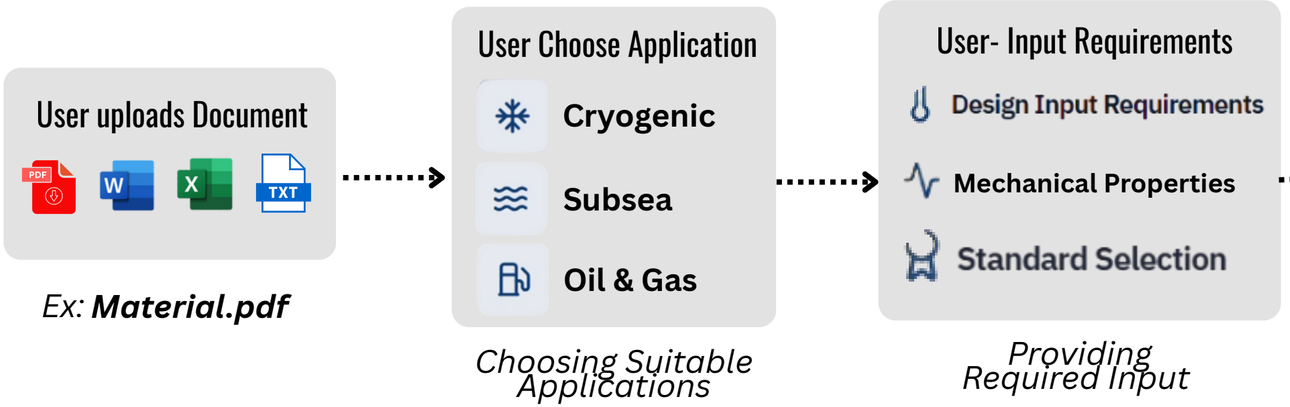
RAG Chatbot

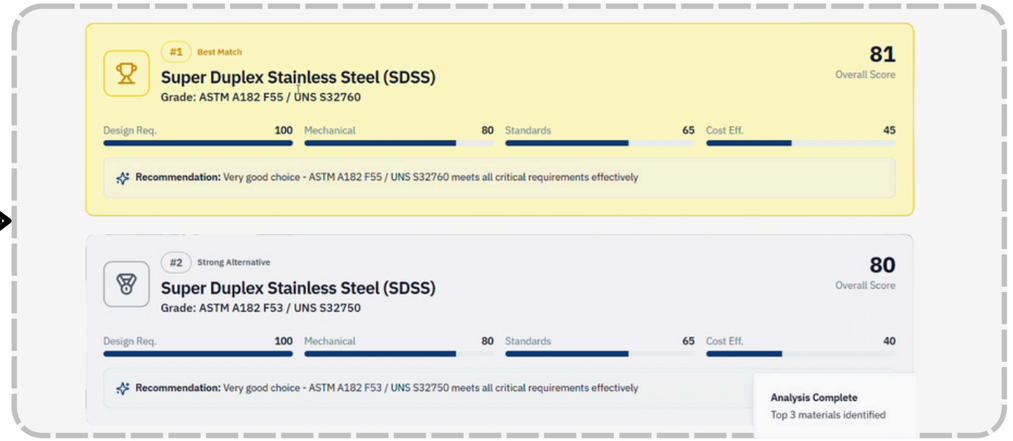
- Semantic search
- LLM Integration
- Matweb Assistant

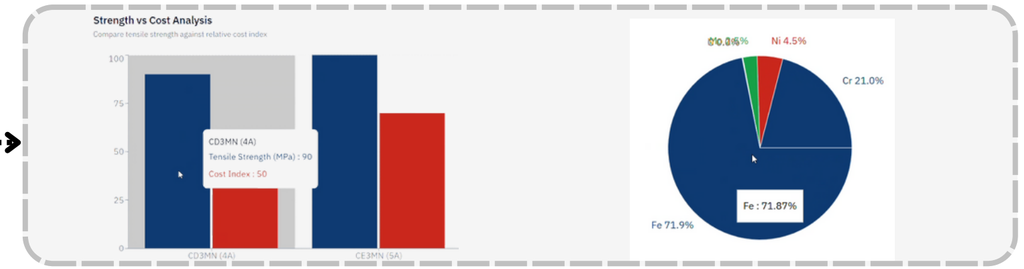
ARCHITECTURE DIAGRAM

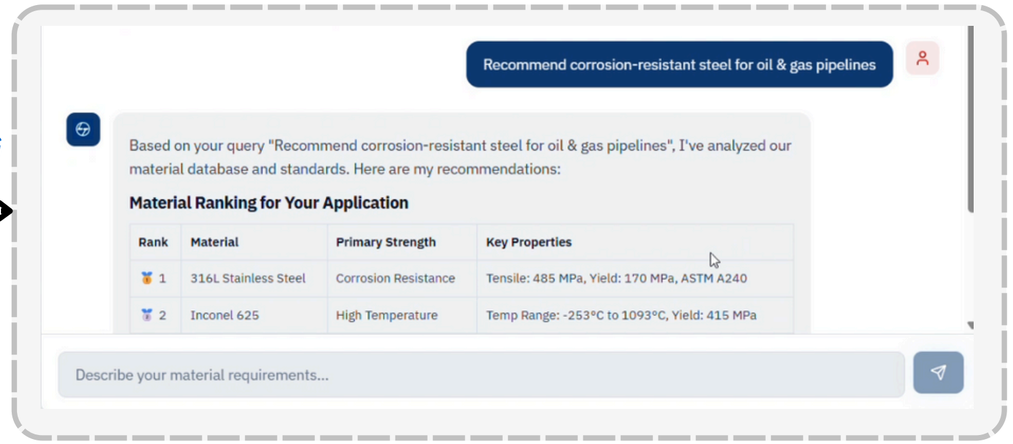


WORKFLOW









- **3–5 main features**

Multi-Stage Material Selection

- Choosing Multi Requirements

Automated Technical Documentation

- Downloadable .docx and .xlsx Output Format
- Unstructured To Structured Analysis

Standards Explorer & Learning Hub

Google Scholar

MatWeb MATERIAL PROPERTY DATA

- Multiple Integrated Hubs For Materials Reference

Intelligent Conversational Interface

Gemini

- RAG + Gemini AI Integrated Chatbot
- Gen-AI Material Ranking Interface

- **What makes your idea different?**

Our Idea: *What If A Person Without **Domain-Expertise** Wants To **Explore, Learn, Automate** & **Choose** The Best Materials From A **10,000+ Materials Database***

AI-First Intelligence For Materials

- Gemini AI conversational search
- Context-aware with reasoning
- 95% faster (2 days → 10 mins)

. Only Platform Integrating 3+ International Standards

- ASTM+IS+BS+DIN+JIS Unified
- 1000+ Standards Database
- Cross-Standard Equivalence Mapping

Intelligent AI Ranking

- 10-Criteria Scoring Algorithm
- Real-Time Property Comparison
- Transparent Material Justification

Predictive Intelligence:

- AI Based Ranking + Multiple Charts
- Future Performance Forecasting
- Cost-Benefit Optimization Dashboard

- **Social or technical benefit**

TECHNICAL BENEFITS

EFFICIENY GAINS

- **95% reduction** in material selection time
- **60% faster** project timelines
- **Handles 1000+** material options in seconds

COST REDUCTION

- Identifies cost-effective alternatives **(avg. 20-30% savings)**
- Prevents expensive material selection errors
- **Reduces rework** and **material waste**

DECISION QUALITY

- **Data-driven recommendations** eliminate guesswork
- Compliance with **international standards** ensured
- **Predictive models** reduce failure risks

SOCIAL BENEFITS

MANUFACTURING INDUSTRY

- Small manufacturers get **enterprise-level material intelligence**
- Levels playing field for startups vs. large corporations
- **Democratizes access** to expensive engineering databases

EDUCATION & RESEARCH

- Free tool for students learning material science
- Accelerates academic research projects
- Builds **next-gen engineering talent**

SUSTAINABILITY

- Suggests **eco-friendly material alternatives**
- Optimizes material usage (less waste)
- Promotes **recycled/sustainable materials**

- **Who will benefit?**

MANUFACTURING COMPANIES

- **30% reduction** in material costs through optimization
- **50% faster** product development cycles
- Compete with **larger companies** on equal footing

SCIENTISTS & RESEARCHERS

- Literature Review: Instant access to **1000+ standards**
- Data Extraction: **AI pulls property data** for **meta-analysis**
- Collaboration: Share material comparisons with **global teams**

STARTUPS & ENTREPRENEURS

- Reduce product development cost by **50%**
- Avoid **early-stage material failures**
- **Faster MVP** to market the full product **(6 months → 3 months)**

MECHANICAL ENGINEERS & DESIGN TEAMS

- Spend **40-60%** of time searching material standards
- Pressure to find **optimal material quickly**
- **Risk of costly mistakes** if wrong material chosen