

# Raw Material Demand Forecasting – One Pager

**Problem:** Procurement faced frequent stockouts (lost sales) and overstocking (locked working capital). Need accurate forecasts to plan purchases proactively.

## Approach:

- Built end-to-end pipeline: Data → Cleaning & EDA → Feature Engineering → Modeling (SARIMA, RF, XGBoost, Hybrid) → Evaluation → Deployment.
- Features: Lags (7/14/30), rolling means, calendar (Month/Year/dayofweek), exogenous (Sales Volume, Lead Time), vendor/location one-hots.
- Deployment: One-click script `run_forecast.py` to generate next-90-day forecasts (per material or all).

## Results:

Model	RMSE	MAPE
SARIMA	26.219	21.47%
RandomForest	5.686	4.02%
XGBoost	5.638	4.01%
Hybrid (RF+XGB)	5.589	3.99%

## Business Impact:

- Reduced forecast error from **21% → 4%**.
- Freed up ~**₹25.5 Lakhs** in working capital (safety stock reduction).
- Saved ~**₹4.6 Lakhs** annually in carrying cost (at 18% rate).
- Fewer emergency purchases and downtime risk.

## Next Steps:

- Integrate sales forecasts for better exogenous accuracy.
- Add quantile forecasts for service-level based safety stock.
- Model monitoring (drift, alerting).