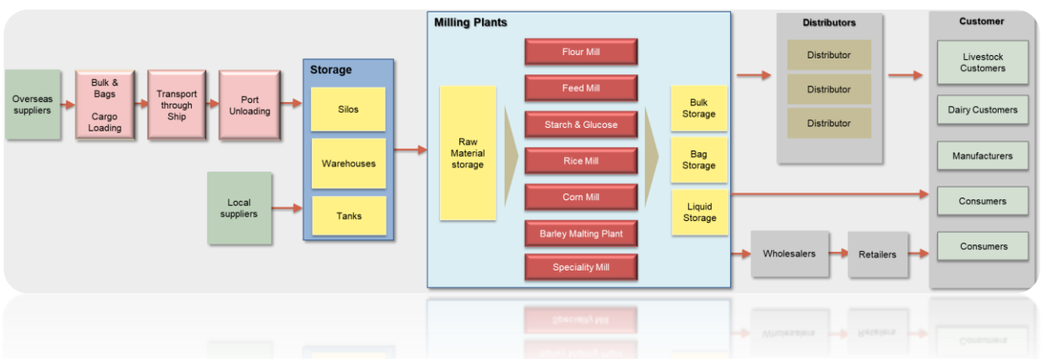

MILLING INDUSTRY SUPPLY CHAIN

Typical Supply Chain | Brief on Milling Industry supply chains | Selected KPIs

Note:
The document is for learning purpose. More details required to engage in any optimization work.
You can reach the author for more details on any supply chain.

Industry Supply Chain Series

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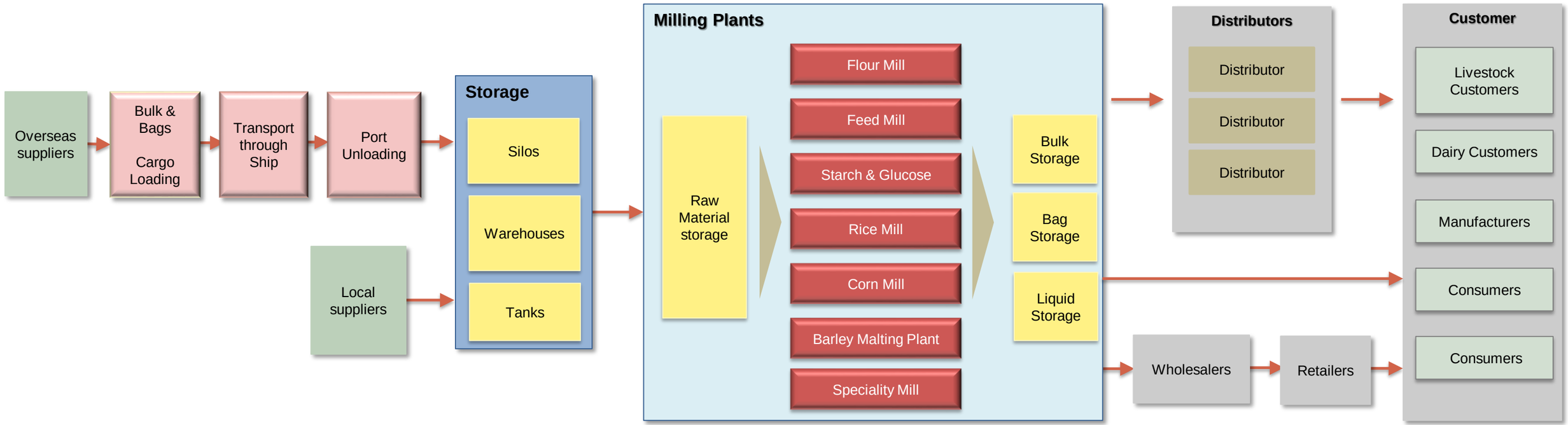
Milling Supply Chain



1. **Flour Mills:** Flour mills specialize in grinding grains, particularly wheat, into flour. These mills may be large-scale industrial facilities or smaller operations, depending on the volume of production and market demand.
2. **Feed Mills**: Feed mills are dedicated facilities that produce animal feed. They receive various grains, such as corn, soybeans, and barley, and process them into balanced feed formulations suitable for different types of livestock, poultry, or aquaculture.
3. **Rice Mills:** Rice mills focus on the processing of rice, removing the husk and bran layers to obtain polished white rice. These mills may also produce rice flour and other rice-based products.
4. **Oat Mills:** Oat mills process oats to produce oatmeal, oat flour, and other oat-based products. These mills may include processes such as cleaning, hulling, and grinding to achieve the desired oat products.
5. **Corn Mills:** Corn mills specialize in the processing of corn kernels to produce various products such as cornmeal, corn flour, grits, and masa (used in making tortillas and other corn-based dishes).
6. **Barley Malting Plants**: Barley malting plants focus on the malting process, where barley grains are germinated, dried, and processed to produce malt. Malt is primarily used in brewing and distilling industries.
7. **Specialty Mills:** Specialty mills cater to specific niche markets and may produce specialty flours or unique grain-based products. These mills can include facilities that process gluten-free grains, ancient grains, or organic grains, among others.

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Flour Mills Supply Chain

1. **Raw Material Procurement**: Flour mills source wheat (or other grains) from farms or bulk suppliers, depending on the mill's location and production scale.
2. **Transportation and Storage**: The wheat is transported to the milling facility and stored in large silos, which preserve the grain's quality and protect it from pests and weather conditions.
3. **Quality Testing**: Upon arrival, wheat is sampled and tested for quality parameters such as protein content, moisture level, and purity, which are critical for producing high-quality flour.
4. **Cleaning Process**: Wheat undergoes an intensive cleaning process, where impurities like stones, dust, and other foreign materials are removed using sifters, magnets, and air classifiers.
5. **Conditioning (Tempering)**: To ensure efficient milling, the wheat is tempered by adding water to adjust its moisture content, which helps toughen the outer bran and softens the inner endosperm.
6. **Milling and Grinding**: The wheat is then ground using a series of roller mills that gradually break down the grain into fine particles, separating the bran and germ from the endosperm.
7. **Sifting and Classification**: Flour is sifted and classified into different grades based on particle size and intended use (e.g., all-purpose flour, bread flour).
8. **Quality Assurance**: Flour batches are regularly tested to ensure they meet the required standards for color, fineness, and baking properties.
9. **Packaging**: The flour is packed into bags or bulk containers based on the needs of customers, ranging from small retail packages to large sacks for industrial clients.
10. **Storage and Inventory Management**: Packaged flour is stored in a controlled environment to maintain its freshness and prevent contamination.
11. **Distribution**: The flour is transported to distribution centers, wholesalers, bakeries, or directly to retailers based on market demand and supply agreements.

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Feed Mills Supply Chain

1. **Ingredient Sourcing**: Feed mills procure various raw materials such as corn, soybeans, wheat, barley, and nutritional additives, depending on the type of feed required.
2. **Logistics and Storage**: Ingredients are transported to the mill and stored in separate bins or silos, maintaining strict storage conditions to prevent spoilage.
3. **Quality Testing and Inspection**: Each raw material is tested for moisture, nutritional content, and contaminants to ensure a safe and effective feed product.
4. **Grinding**: Ingredients are ground to a specific particle size to ensure consistency in the final feed product, which aids in animal digestion.
5. **Formulation and Mixing**: Ingredients are mixed in precise proportions according to specific feed formulas tailored to the nutritional needs of livestock, poultry, or fish.
6. **Pelleting or Extrusion**: For better palatability and handling, the mixed feed is often converted into pellets or extruded into specific shapes.
7. **Cooling and Drying**: Pellets are cooled and dried to the proper moisture level to ensure durability and shelf stability.
8. **Packaging and Labeling**: Finished feed is packaged into bags or bulk containers, with clear labeling for traceability and usage instructions.
9. **Inventory and Quality Control**: Feed batches are tested for consistency and quality, while inventory is monitored to avoid shortages and overproduction.
10. **Distribution and Delivery**: Feed is delivered to farms, feed stores, or distributors, with schedules aligned to meet farmers' or livestock operations' needs.

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Rice Mills Supply Chain

1. **Paddy Procurement**: Rice mills procure paddy (unmilled rice) from farms or suppliers.
2. **Transportation and Storage**: Paddy is transported to the mill, where it is stored in warehouses or silos to preserve freshness and avoid moisture buildup.
3. **Cleaning and Dehusking**: Paddy is cleaned to remove stones, straw, and other impurities. It then undergoes dehusking, where the outer husk is removed, resulting in brown rice.
4. **Polishing (Whitening)**: Brown rice is polished by removing the bran layer, creating white rice. The level of polishing may vary based on the desired product (e.g., white rice, partially polished rice).
5. **Grading and Sorting**: Rice is sorted based on grain size, color, and broken percentage, with machines that can identify and separate broken or discolored grains.
6. **By-product Processing**: By-products such as rice husk and bran are collected and can be used for energy production or animal feed.
7. **Quality Control**: Processed rice undergoes quality tests for moisture, foreign matter, and grading specifications.
8. **Packaging**: The final product is packaged in various bag sizes for retail, wholesale, or export markets.
9. **Storage and Inventory Management**: Packaged rice is stored in climate-controlled warehouses to ensure longevity.
10. **Distribution**: Rice is distributed to retailers, wholesalers, and export markets, with logistics planned to minimize transit times and maintain product quality.

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Oat Mills Supply Chain

1. **Sourcing and Receiving**: Oats are sourced from farms and suppliers, chosen based on variety, quality, and freshness.
2. **Transportation and Storage**: The oats are transported to the milling facility and stored in controlled environments to prevent spoilage.
3. **Cleaning**: Oats are cleaned to remove dust, stones, and other foreign materials using air classifiers and sieves.
4. **Hulling**: The outer hull is removed from the oats, resulting in oat groats, which are further processed.
5. **Steaming and Kilning**: Oats are heat-treated to stabilize them, which helps prevent rancidity and ensures a longer shelf life.
6. **Rolling or Cutting**: Oat groats are rolled or cut to create products like rolled oats or steel-cut oats.
7. **Grinding (optional)**: Some oats are ground into fine oat flour, depending on product requirements.
8. **Quality Assurance**: Oat products are tested for quality, texture, moisture, and purity.
9. **Packaging**: The finished products are packaged in various sizes for retail, bulk, or industrial uses.
10. **Distribution**: Oat products are transported to distributors, retailers, and food manufacturers.

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Corn Mills Supply Chain

1. **Raw Material Sourcing**: Corn is sourced from farms, often with attention to specific varieties based on the end product.
2. **Transportation and Storage**: Corn is transported and stored in silos, with close monitoring to prevent contamination.
3. **Cleaning and Conditioning**: Corn undergoes cleaning to remove impurities and is conditioned with water to ease milling.
4. **Degermination**: Corn kernels are processed to separate the germ, endosperm, and bran.
5. **Grinding**: The endosperm is ground to produce cornmeal, grits, or flour, while the germ is often extracted for oil.
6. **Sifting and Grading**: The ground corn is sifted to separate products based on fineness.
7. **Quality Testing**: Samples are tested for moisture, particle size, and nutrient content to ensure quality.
8. **Packaging and Labeling**: Products are packaged and labeled according to customer requirements.
9. **Inventory Management**: Packaged products are stored and inventoried for efficient distribution.

Distribution: Corn products are distributed to food processors, retailers, and other end-users.

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Barley Malting Plants Supply Chain

1. **Barley Sourcing**: Barley is sourced from farms, with specific varieties chosen for brewing and distilling.
2. **Cleaning and Storage**: Barley is cleaned to remove impurities and stored in a controlled environment.
3. **Steeping**: Barley is soaked in water to begin the germination process.
4. **Germination**: The barley is spread out to germinate, developing enzymes necessary for the malting process.
5. **Kilning**: Germinated barley is dried in kilns, which halts germination and creates the desired flavor and color profile.
6. **Sorting and Grading**: Malt is sorted and graded based on quality parameters like enzyme content.
7. **Quality Control**: Samples are tested to ensure they meet brewing or distilling specifications.
8. **Packaging**: Malt is packaged in bulk bags or containers for transport.
9. **Storage and Inventory**: Packaged malt is stored with careful humidity control to maintain freshness.
10. **Distribution**: Malt is transported to breweries, distilleries, or export markets.

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Specialty Mills Supply Chain

1. **Sourcing Niche Grains**: Specialty mills source unique grains such as quinoa, gluten-free grains, or organic varieties.
2. **Quality Assurance and Storage**: Niche grains are carefully stored, with strict quality controls due to their premium nature.
3. **Cleaning and Preparation**: Grains undergo cleaning and preparation tailored to their specific needs.
4. **Milling and Processing**: Specialized milling techniques are used to retain the grains' unique qualities.
5. **Quality Testing and Compliance**: Finished products are tested, often with certifications like organic, non-GMO, or gluten-free.
6. **Packaging and Branding**: Products are packaged with detailed labeling to communicate niche qualities to consumers.
7. **Inventory Management**: Specialty products are stored with care to prevent cross-contamination.
8. **Distribution and Retailing**: Products are distributed to specialty food stores, health stores, or directly to consumers.

Common KPIs Across All Milling Industries

KPI	Description	Formula	Benefit	Data Source	Responsible Team
Cost of Raw Materials	Total cost per unit of raw materials used	Total Raw Material Cost / Total Units Produced	Controls input costs and improves profitability	Procurement records	Procurement, Finance
Yield Efficiency	Finished output vs. raw material input	(Output Product / Input Material) x 100%	Maximizes yield, optimizes resource utilization	Production records	Production
Energy Consumption per Unit	Energy usage per production unit	Total Energy Used / Total Units Produced	Reduces energy costs, lowers environmental impact	Utility bills, ERP	Engineering, Maintenance
Downtime Rate	Production downtime as a percentage	(Downtime Hours / Total Hours) x 100%	Minimizes downtime, boosts productivity	Production logs	Maintenance
Inventory Turnover	Frequency of inventory usage	Cost of Goods Sold / Average Inventory	Reduces holding costs, improves cash flow	Inventory records	Inventory Management
Order Fulfillment Rate	On-time delivery of customer orders	(Orders Fulfilled On-Time / Total Orders) x 100%	Enhances customer satisfaction and loyalty	Sales records	Sales, Distribution
Quality Control Compliance	Adherence to product quality standards	% of Product Meeting Quality Standards	Ensures product quality, strengthens brand trust	Quality Control reports	Quality Assurance
Shrinkage & Loss Rate	Material losses during processing	(Shrinkage Loss / Total Material) x 100%	Reduces waste, optimizes material handling	Inventory records	Inventory, Production
Traceability Accuracy	Ability to trace product origins	% of Products Fully Traceable	Ensures food safety, meets regulatory compliance	Quality Control reports	Quality Assurance
Safety Incident Rate	Safety incidents per hours worked	(Incidents / Total Hours) x 200,000	Enhances workplace safety, maintains compliance	Safety records	Safety, Operations
Production Efficiency	Product output per labor hour	Total Units Produced / Total Labor Hours	Increases operational efficiency	Production logs	Operations
Manufacturing Efficiency	Output per equipment hour	Total Units Produced / Machine Hours Used	Optimizes equipment use, reduces wear and tear	Production logs, ERP	Operations
Distribution Efficiency	On-time and complete delivery	(On-Time Deliveries / Total Deliveries) x 100%	Enhances logistics, improves customer satisfaction	Delivery records	Distribution
Forecast Accuracy	Demand prediction accuracy	(Forecasted - Actual Demand) / Forecasted Demand	Improves planning, aligns with market demand	Forecast records	Sales, Operations
Packaging Quality Control	Compliance with packaging standards	% Products Meeting Packaging Standards	Reduces damage, preserves product quality	Quality checks	Quality Assurance

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Milling Industry KPIs Common

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Feed Milling

KPI	Description	Formula	Benefit	Data Source	Responsible Team
Formulation Efficiency	Accuracy in feed mix ratios	% Deviation from Formulation	Reduces costs, ensures nutritional consistency	Quality records, ERP	Production, Quality
Pellet Durability Index (PDI)	Durability of pelleted feed	PDI Score	Ensures pellet quality, reduces dust and waste	Quality Control tests	Production, Quality Assurance
Vitamin and Mineral Compliance	Adherence to nutrient levels	% Feed Meeting Nutrient Targets	Ensures dietary balance in feed	Quality reports, ERP	Production, Quality Assurance
Feed Conversion Ratio (FCR)	Animal growth per feed unit	Animal Weight Gain / Feed Intake	Measures feed efficiency for optimal animal health	Production, ERP	Production, Quality Assurance

Flour Milling

KPI	Description	Formula	Benefit	Data Source	Responsible Team
Extraction Rate	Proportion of flour extracted from wheat	(Flour Output / Wheat Input) x 100%	Maximizes flour output, controls wheat usage	Production logs	Production
Ash Content in Flour	Measurement of mineral content in flour	% Ash Content in Flour	Ensures flour quality, maintains grade standards	Quality tests	Quality Assurance
Gluten Strength	Gluten protein quality in flour	Gluten Index	Determines baking quality, aligns with market needs	Quality lab tests	Quality Assurance

Starch and Glucose Plants

KPI	Description	Formula	Benefit	Data Source	Responsible Team
Starch Yield	Amount of starch extracted per input	(Starch Produced / Input Material) x 100%	Optimizes resource use, maximizes starch yield	Production logs	Production
Glucose Purity	Purity level of glucose produced	% Purity	Ensures product quality, meets customer standards	Quality lab tests	Quality Assurance
Dry Substance Content	Amount of solids in the glucose product	% Dry Substance Content	Ensures consistency, improves shelf life	Production records	Quality Assurance

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Rice Milling

KPI	Description	Formula	Benefit	Data Source	Responsible Team
Broken Rice Percentage	Proportion of broken grains in final product	(Broken Grains / Total Grains) x 100%	Reduces wastage, improves product quality	Quality control records	Production, Quality Assurance
Polishing Degree	Level of rice polishing achieved	% Polishing Degree	Enhances appearance, improves marketability	Production records	Quality Assurance
Moisture Content in Final Rice	Moisture level of milled rice	% Moisture Content	Maintains freshness, prevents spoilage	Quality lab tests	Quality Assurance

Corn Milling

KPI	Description	Formula	Benefit	Data Source	Responsible Team
Grit Yield	Yield of corn grits from raw corn	(Grits Produced / Raw Corn Input) x 100%	Maximizes grit output, controls corn usage	Production logs	Production
Fines Generation Rate	Percentage of fine particles in final output	(Fines / Total Product) x 100%	Minimizes waste, improves product quality	Quality control records	Quality Assurance
Oil Content in Corn Flour	Oil level in the corn flour	% Oil Content	Ensures product quality, meets specifications	Quality lab tests	Quality Assurance

Barley Malting

KPI	Description	Formula	Benefit	Data Source	Responsible Team
Malt Yield	Ratio of malt produced from raw barley	(Malt Output / Barley Input) x 100%	Optimizes raw material use, improves yield	Production logs	Production
Moisture Content in Malt	Moisture level in finished malt	% Moisture Content	Ensures quality, maintains storage stability	Quality lab tests	Quality Assurance
Germination Efficiency	Success rate in barley germination	(Germinated Barley / Total Barley) x 100%	Improves malt quality, optimizes germination	Production records	Production, Quality Assurance

Specialty Mills (e.g., Spice Mills, Cocoa Processing)

KPI	Description	Formula	Benefit	Data Source	Responsible Team
Flavor Retention	Level of essential oils/flavor compounds retained	% Retention of Flavor Compounds	Ensures quality, meets customer expectations	Quality lab tests	Quality Assurance
Moisture Retention in Final Product	Moisture content post-processing	% Moisture Content			

Author Profile

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A business leader and expert in building and managing complex supply chain organizations with experience in designing and deployment of strategy, planning, and operations. Overall profit and loss responsibility, lead large and diversified teams, and manage transformations. Drive global programs and projects, roll-out strategic initiatives, build corporate competencies and provide strategic direction. A strategist and expert in strategy execution, supply chain excellence, digital transformations, business process re-engineering, performance management, operations strategy, and ERP implementations.

EXPERIENCE

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- Supply Chain Strategy, Planning, & Operations
- Business Planning, Forecasting & Budgeting
- Manufacturing Excellence
- Business Process Re-Engineering/Management
- Enterprise Resource Planning & EPM
- Supply Chain Execution Systems (WMS, MES, TMS, GTM,DP,CT, SCO)
- Project Management & PMO
- AI/ML & IIoT
- Organizational Transformations

INDUSTRIES

- Agri Food
- Mining
- Automotive
- FMCG
- Manufacturing
- Logistics
- Government
- Retail

CERTIFICATIONS

- BSC Certified Graduate
- PMP
- CPIM
- LSSBB
- EPM (IBM PA)
- ERP
- Explaining Strategy

- Middle East, Africa, India
- 30+ Years

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