

Chemicals

Drilling Chemicals Workshop

Business Opportunities

14th January 2025

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iktva Program Overview (1/2)

The In-Kingdom Total Value Add (iktva) program is designed to drive increased investment, economic diversification, job creation, and workforce development within the Kingdom

Saudi Aramco aims to achieve 70% localization of all spending




iktva in Procurement

2000+ Service contracts	290+ Corporate purchase agreements
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Business Opportunities

12 Sectors	210 Business Opportunities	\$28 bn Annual Market Size
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Anchor Projects

6 Anchor projects

 IMI	 SPARK	 Tuwaiq
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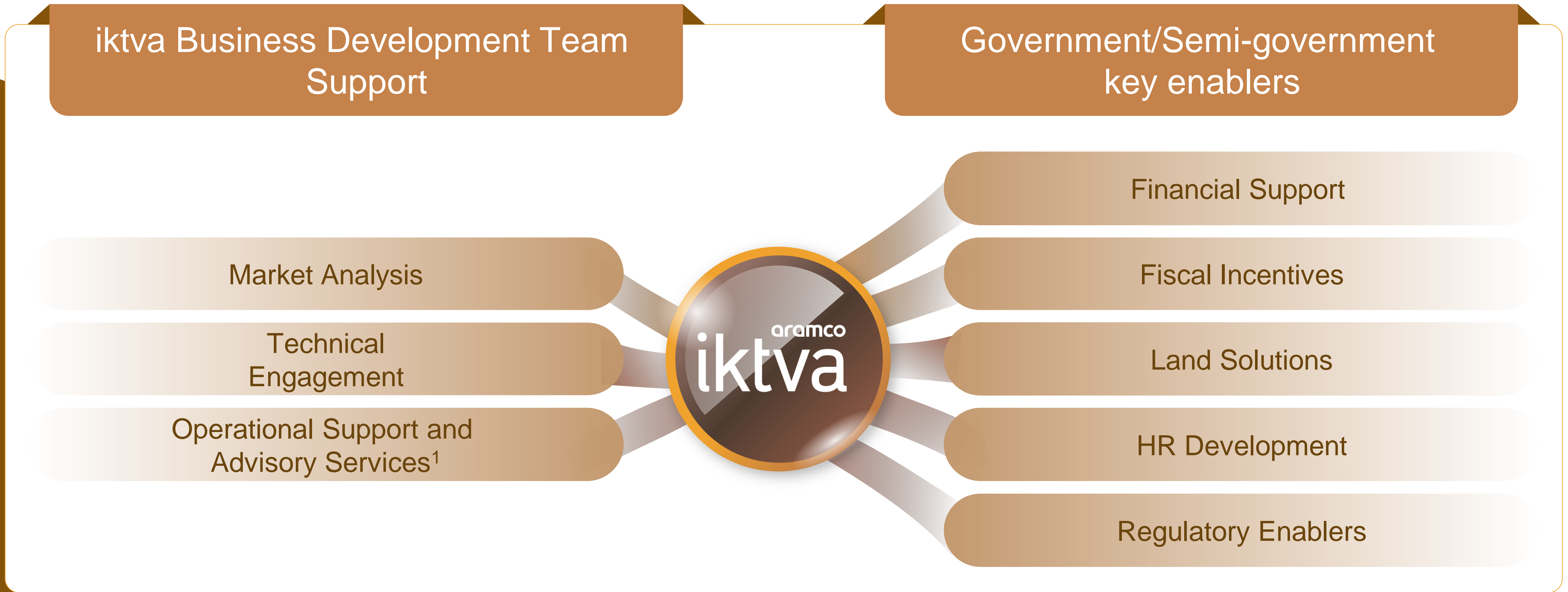
Local Workforce Development

16 National training centers	90+ Programs
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Catalyzing Supply Chains

Note: IMI = International Maritime Industries; SPARK = King Salman Energy Park

Fire protection workshop











Catalyzing Supply Chains

1. Includes broad range of support services provided by the team: user requirements, advisory on available financial and fiscal incentives, guidance on localization process in line with local regulations and standards, action plan development etc.

Why invest in KSA?

Non-exhaustive

 Strong GDP growth and healthy economy	 Big market and game-changing opportunities	 Government incentives and enablers	 Ease of doing business	 Strategic global location	 Favorable demographics
Top 20 economies globally	5 Special Economic Zones drive innovation	\$1.3T+ invested in private sector by 2030	 one of world's most rewarding tax systems	12-15% of global trade passes via Red Sea	17% population growth from 2013-2023
GDP growth among highest projected in 2025 in top economies	6 giga projects driving urbanization and industry	5.7% contribution of FDI to GDP by 2030	Top 5 in the MENA region for ease of doing business	 KSA container ports are among the most efficient globally	67% of population below the age of 35

Catalyzing Supply Chains

Note: FDI = Foreign Direct Investment
Source: IMF; MISA; Vision 2030 Key Performance Indicators; Shareek Program; World Bank

1 Subsidies and financial programs

Loans financing up to 75% of the industrial project provided by SIDF to foster industrial development

2 Tax incentives and exemptions

Tax exemptions for earnings from exports and up to 50% tax credit on Saudi nationals' payroll and training costs for 10 years

3 Industrial Zones and Economic Cities

Industrial zones like Plaschem Park, SPARK and Jubail Industrial City provide specialized infrastructure and logistical services essential for chemical manufacturing

4 Customs and import duty reductions

MIM offers zero import duties for localization of selected raw materials, machinery, & equipment

5 Visa and legal support

Streamlined visas for investors and skilled workers, with legal support via MISA for fast business setup and compliance



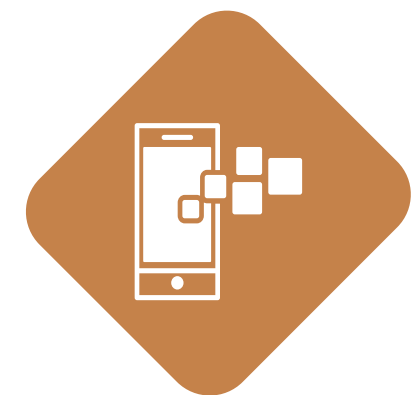
Catalyzing Supply Chains

Four key drivers for the KSA drilling chemicals market



Consumer industry trends

- Integration of mature drilling market with new opportunities in unconventional (e.g., Jafurah) drives demand for high-performance drilling chemicals to support intense operations



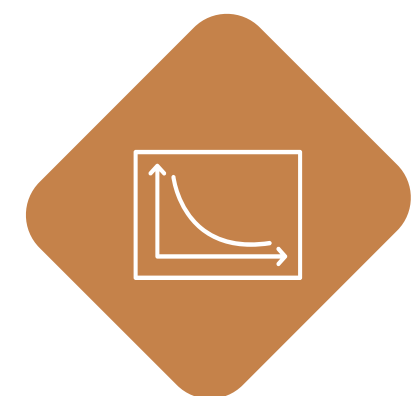
Technological advancements

- Advanced technologies like horizontal drilling, hydraulic fracturing in unconventional exploration and stimulation of mature fields for enhanced oil recovery leads to increased demand for specialized drilling chemicals



Sustainability and environmental regulations

- Increasing regulatory requirements and environmental concerns necessitate sustainable practices and environment friendly oilfield chemicals aiming to reduce the impact of operations



Economic factors

- KSA is an established supplier of oil and gas to mature and emerging markets with growing demographics and economies while being positioned as a leader in carbon footprint optimization in oil and gas production

Catalyzing Supply Chains

How do we define what is an opportunity?



Growing market

High growth high spend markets



**Limited local players
& import driven**

*Markets with few local contributors
and high import resilience*



**Technological
& labor feasibility**

*Markets with accessible or
standardized technology and
available skilled labor*

Drilling Chemicals Market Overview

KSA drilling chemical market snapshot



2024 KSA market size for opportunities
in today's workshop

16 opportunities to be discussed today

- 1 Calcium chloride
- 2 Xanthan gum
- 3 PHPA
- 4 Sodium carbonate
- 5 Calcium carbonate flakes
- 6 Synthetic lubricant
- 7 Polyanionic cellulose
- 8 Hydroxyethyl cellulose
- 9 Sodium bromide
- 10 Sulphonated asphalt
- 11 Synthetic graphite
- 12 Manganese tetroxide
- 13 High temperature fluid loss control polymer
- 14 H₂S scavenger zinc free iron gluconate
- 15 Thinner / dispersant OBM conditioner
- 16 Ceramic Proppant

Calcium Chloride

Business Opportunity

Opportunity profile

1

KSA in high need of calcium chloride to realize ongoing mega-projects and expansion plans in oil & gas

Type(s)

Calcium chloride
 (77-78%)

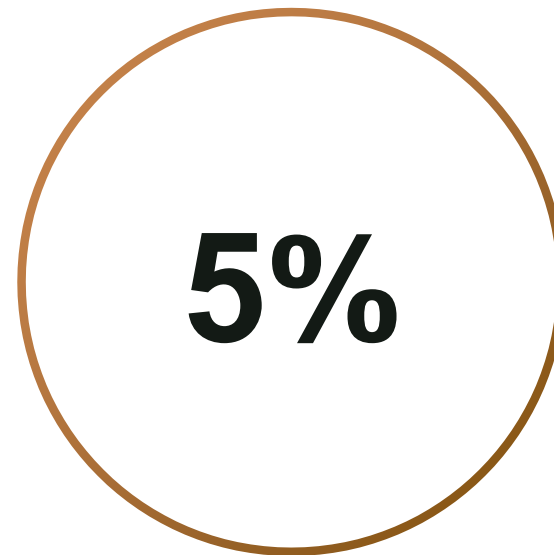
Specific gravity:
 1.4

2

Calcium chloride market is expected to show moderate growth



Estimated 2024
 KSA market size

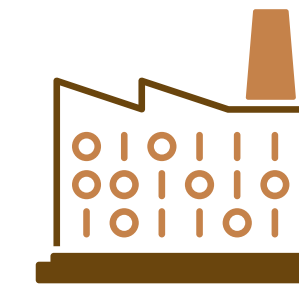


Forecasted 5-year
 CAGR

3

Attractive investment opportunities within calcium chloride value chain

KSA value chain opportunities



Product formulation

Catalyzing Supply Chains

Technical overview

Calcium Chloride (77–78%)¹

General specifications

- Chemical formula: CaCl₂
- Specific Gravity: 1.4
- Form: Dry Flakes, pellets, or granular

Oil & Gas applications

- Drilling and completion fluids
- Hydration control and dehydration of gas
- Corrosion control

Other applications

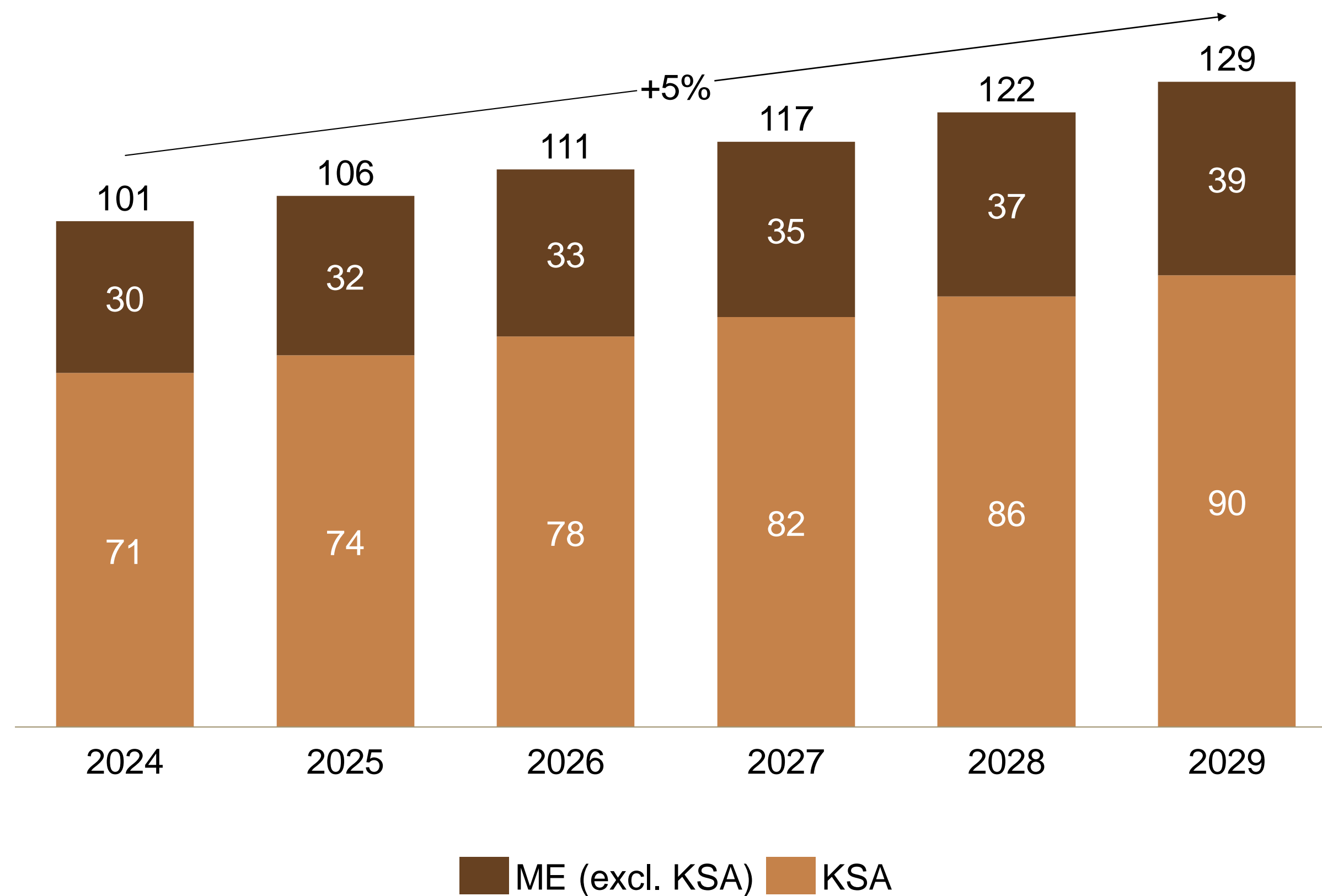
- Dust Control
- Fertilizer
- Water treatment

Catalyzing Supply Chains



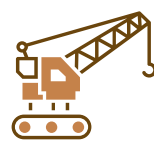
1. Aramco material number 1000022533
Source: Expert interviews, Saudi Aramco analysis, team analysis

Calcium chloride demand, customers, and drivers

Forecasted Middle East calcium chloride market 2024-2029 (\$MM)



Typical customers in KSA

-  Oil & Gas players
-  Mining sector¹
-  Construction industry

Key KSA demand drivers

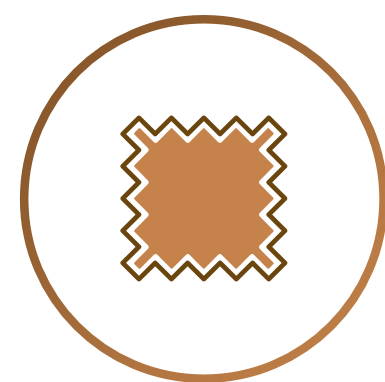
- **Industry expansion:** Expansion plans for oil wells and rigs lead to demand increase in CaCl₂, used as a stabilizing agent in drilling
- **Economic diversification:** Growing number of ongoing mega-projects in Kingdom leads to increase in demand for construction materials and onsite dust control

Drilling Chemicals workshop

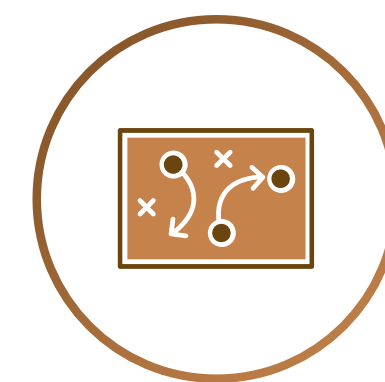
Catalyzing Supply Chains

1. Onsite dust control stabilization
Source: S&P global commodity insights, expert interviews, team analysis

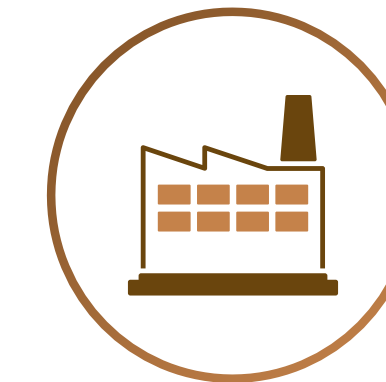
Value chain and key localization opportunities



Raw materials



Intermediate process



Product formulation

Local saturation



Multiple players



Multiple players



Few players

Current value chain

- Calcium carbonate (Limestone) used as raw material is localized

- Intermediary products such as calcium hydroxide and hydrochloric acid are currently localized

- Opportunity to localize calcium chloride (77-78%) production

Opportunity

Success factors

Technology



Labor



- Evaporation technology to produce calcium chloride

- Skilled chemical engineers for optimizing the chemical process

Catalyzing Supply Chains

Xanthan Gum

Business Opportunity

Opportunity profile

1

Xanthan gum key for growing oil and gas and food & beverage industry

2

Xanthan gum is expected to show moderate growth

3

Attractive investment opportunities in for the xanthan gum value chain

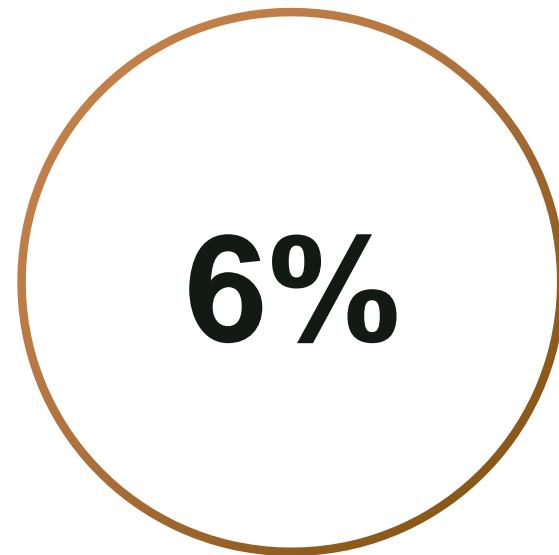
Type(s)

Xanthan gum

Specific gravity:
1.3-1.5

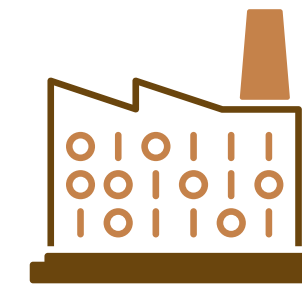


Estimated 2024
KSA market size



Forecasted 5-year
CAGR

KSA value chain opportunities



Product formulation

Catalyzing Supply Chains

Technical overview

Xanthan Gum¹

General specifications

- Biopolymer

- Specific Gravity: 1.3–1.5

- Form: Free flowing granular powder

Oil & Gas applications

- Drilling fluid additive to improve viscosity
- Fluid loss control agent
- Lubrication enhancer

Other applications

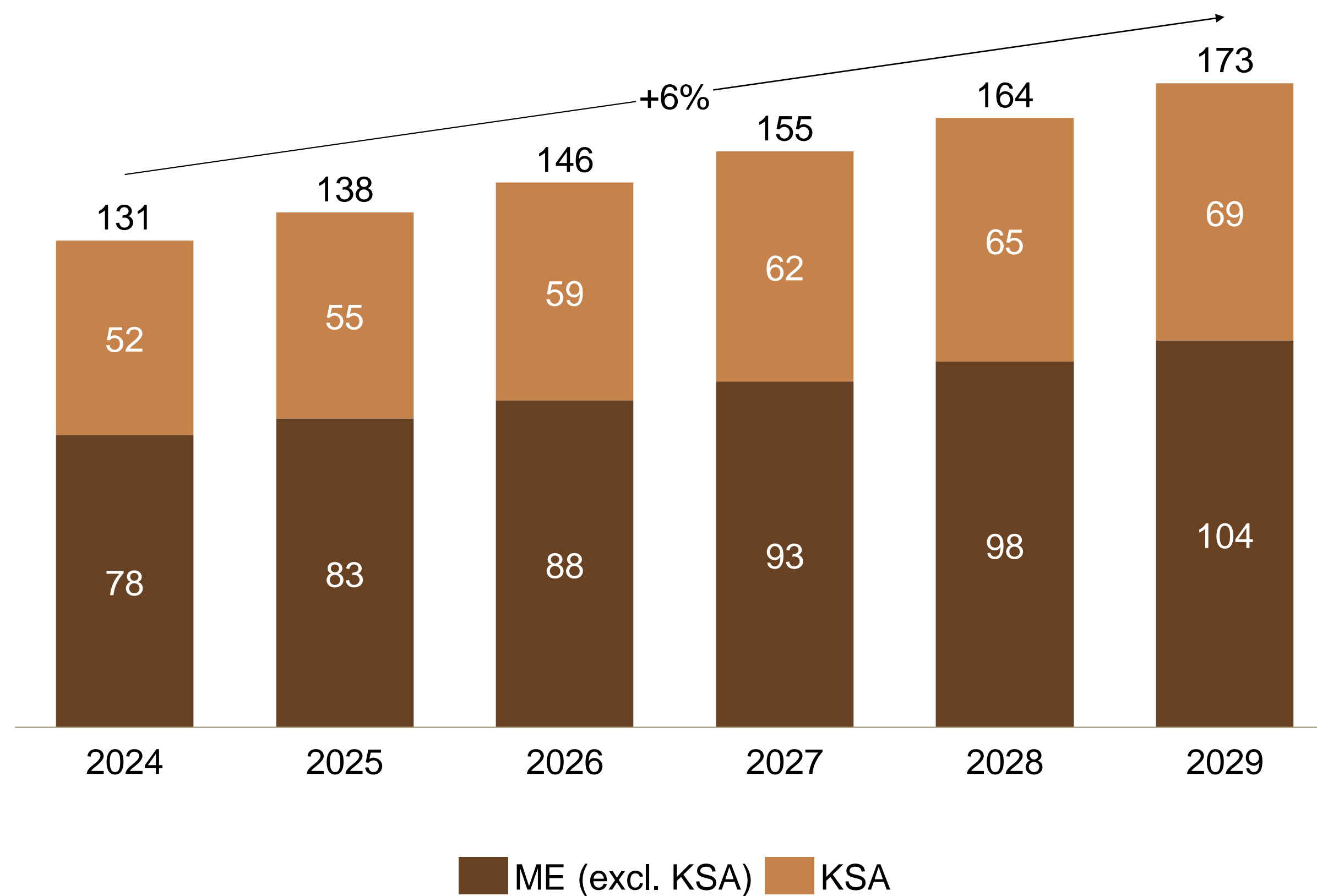
- Food additive agent
- Rheology control and suspension agent in fresh water
- Fire retardant
- Dye thickener

Catalyzing Supply Chains




1. Aramco material number: 1000021930
 Source: Expert interviews, Saudi Aramco analysis, team analysis

Xanthan gum demand, customers, and drivers

Forecasted Middle East xanthan gum market 2024-2029 (\$MM)



Typical customers in KSA

-  Oil & Gas players
-  Industrial manufacturing
-  Food and beverage industry

Key KSA demand drivers

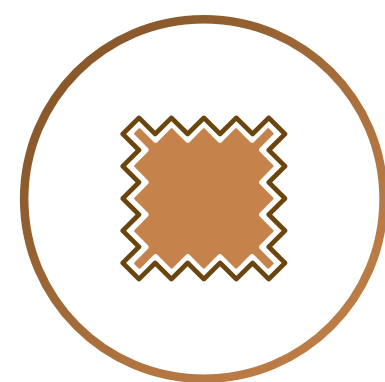
- **Industry trends:** Rise in targeted daily oil production through 2027 increasing need for xanthan gum as an additive for drilling fluid
- **Economic factors:** Growing number of ongoing mega-projects in Kingdom leads to increase in demand for xanthan gum used as stabilizing agent in cleaning agents and paint coatings

Drilling Chemicals workshop

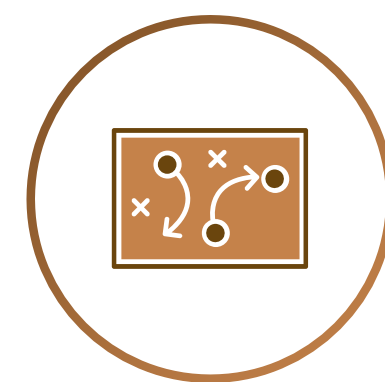
Catalyzing Supply Chains

1. Onsite dust control stabilization
Source: S&P global commodity insights, expert interviews, team analysis

Value chain and key localization opportunities



Raw materials



Intermediate process



Product formulation

Local saturation



No players

Current value chain

- Corn and maize mostly imported as climate is not naturally conducive for large-scale cultivation



Multiple players

- Production of intermediary products such as corn starch, and glucose available locally



Few players

- Opportunity to localize different grades of xanthan gum production

Opportunity

Success factors

Technology



Labor



- Bioreactors with oxygenation & antifoaming capabilities

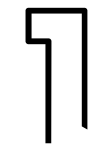
- Microbiologists with expertise in controlled fermentation conditions

Catalyzing Supply Chains

**Partially Hydrolyzed
Polyacrylamide (PHPA)**

Business Opportunity

Opportunity profile



PHPA is a critical component for the Kingdom's O&G expansion plans



PHPA market is expected to show moderate growth



Attractive investment opportunities exist within the PHPA value chain

Type(s)

PHPA

Specific gravity:
0.75-1.4

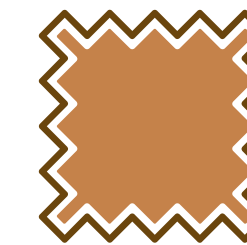


Estimated 2024
KSA market size

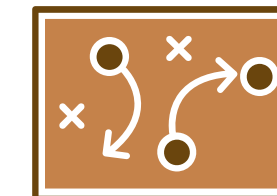


Forecasted 5-year
CAGR

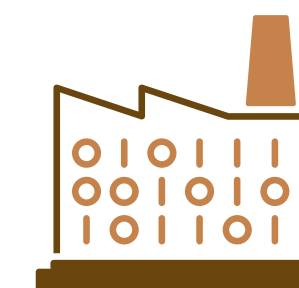
KSA value chain opportunities



Raw material



Intermediate process



Product formulation

Technical overview

PHPA¹

General specifications

- Specific gravity: 0.75–1.4
- Form: Powdered form
- Highly soluble in water

Oil & Gas applications

- Shale stabilizer
- Reduces fluid loss
- Controls filtration rate
- Controls viscosity

Other applications

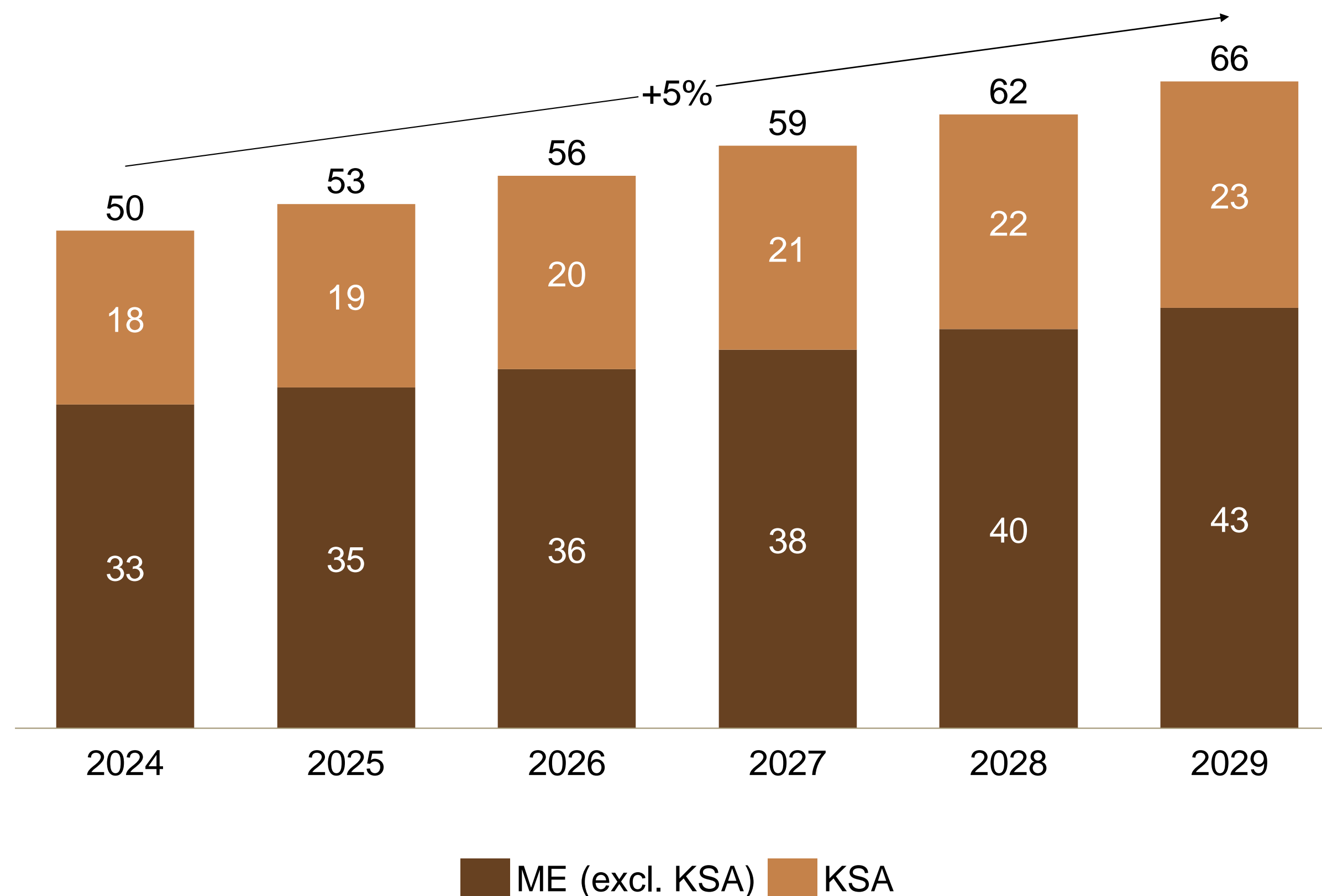
- Flocculant in wastewater treatment
- Concrete additive for water retention

Catalyzing Supply Chains

1. Aramco material number 1000866365
 Source: Expert interviews, Saudi Aramco analysis, team analysis

PHPA demand, customers, and drivers

Forecasted Middle East PHPA market 2024-2029 (\$MM)



Typical customers in KSA



Oil & Gas players



Municipal & industrial wastewater treatment

Key KSA demand drivers

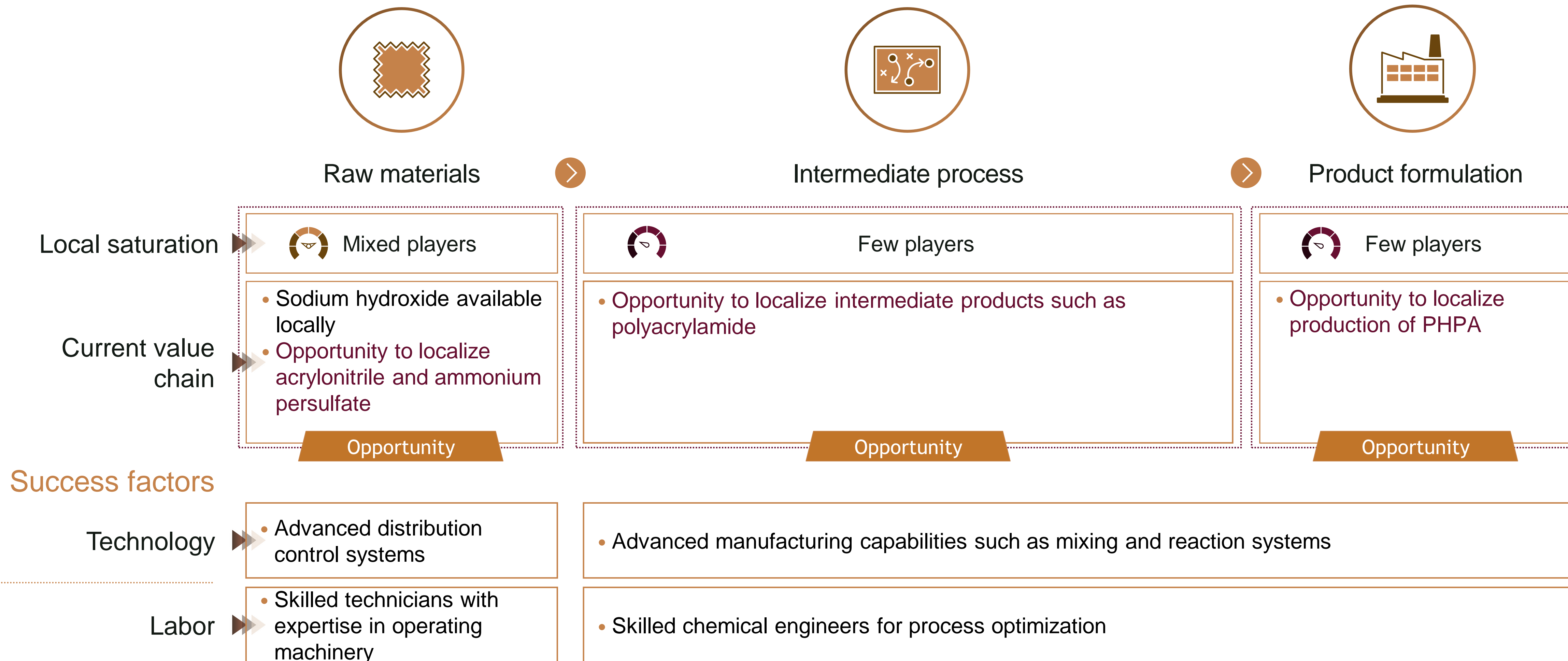
- **Consumer industry:** PHPA is core component used to improve oil displacement efficiency in EOR¹, rising technology with growing demand in the O&G industry
- **Sustainability and environmental regulations:** KSA ambition of achieving 100% usage of treated wastewater leads to growing demand for PHPA commonly used for wastewater treatment

Drilling Chemicals workshop

Catalyzing Supply Chains

1. Enhanced Oil Recovery
Source: S&P global commodity insights, expert interviews, team analysis

Value chain and key localization opportunities



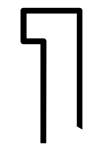
Drilling Chemicals workshop

Catalyzing Supply Chains

Sodium Carbonate (Soda Ash)

Business Opportunity

Opportunity profile



Soda Ash increasingly important as KSA O&G and glass manufacturing grows



Soda ash market is expecting moderate growth over the next 5 years



Attractive investment opportunities across sodium carbonate value chain

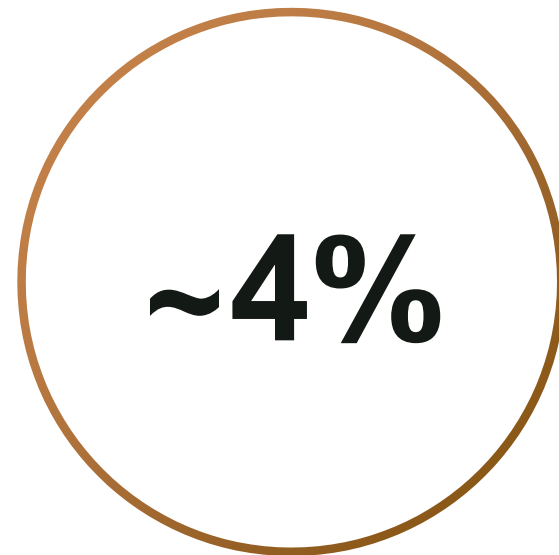
Type(s)

Sodium carbonate

Specific gravity: 2.53

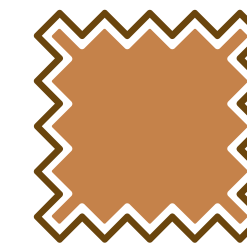


Estimated 2024 KSA market size

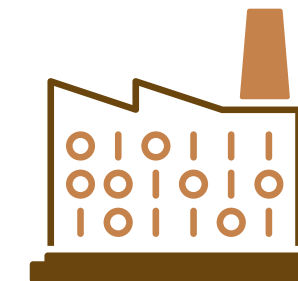


Forecasted 5-year CAGR

KSA value chain opportunities



Raw material



Product formulation

Technical overview

Sodium Carbonate¹

General specifications

- Chemical formula: Na_2CO_3

- Specific Gravity: 2.53

- Form: Fine white powder

Oil & Gas applications

- pH adjustment and alkalinity control of drilling fluids
- Clay stabilization

Other applications

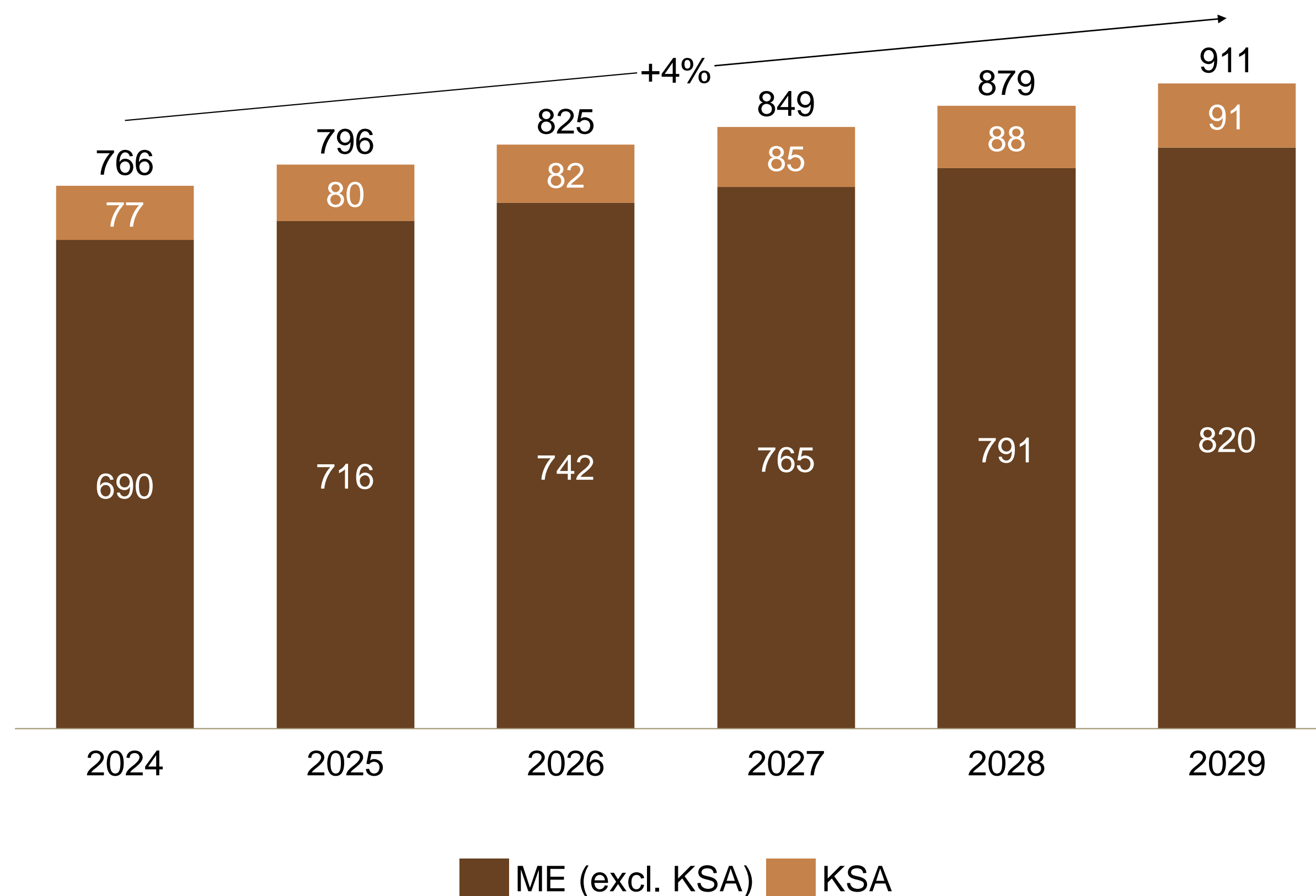
- Water softener
- Glass production
- Alumina production
- Soaps and detergents

Catalyzing Supply Chains

1. Aramco material number 1001079695
 Source: Expert interviews, Saudi Aramco analysis, team analysis

Sodium carbonate demand, customers, and drivers

Forecasted Middle East sodium carbonate market 2024-2029 (\$MM)



Typical customers in KSA



Oil & Gas players



Glass manufacturing



Mining industry

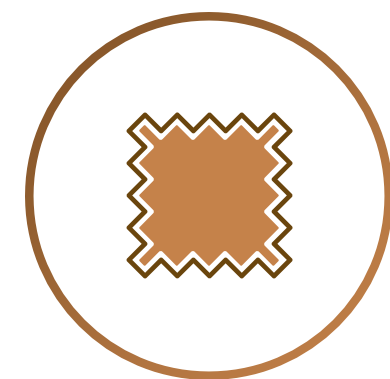
Key KSA demand drivers

- **Consumer industry trends:** Rise in targeted daily oil production through 2027 leading to higher demand for soda ash as an additive to drilling fluids
- **Vision 2030 infrastructure projects:** Growing demand for glass materials across existing megaprojects contributing as a key driver for soda ash production

Catalyzing Supply Chains

Note: Turkey is included which is a major consumer of sodium carbonate for its glass manufacturing industry
 Source: S&P global commodity insights, expert interviews, team Analysis

Value chain and key localization opportunities



Raw materials



Product formulation

Local saturation

Mixed players

Current value chain

- Production materials such as ammonia, and sodium chloride are localized
- Opportunity to localize calcium carbonate production

Opportunity

Few players

- Opportunity to localize sodium carbonate production

Opportunity

Success factors

Technology

- Precision grinding and particle size control technology

Labor

- Engineer with expertise in process engineering and material science

- Solvay process & natural trona process technology

- Chemical engineers with expertise in optimizing parameters to maximize output

Catalyzing Supply Chains

Calcium Carbonate Flakes

Business Opportunity

Technical overview

Calcium Carbonate: Fine Flakes¹

General specifications

- Chemical formula: CaCO₃

- Specific Gravity: 2.72–2.78

- Particle size: 100 US Mesh (85–95% WT)

Calcium Carbonate: Medium Flakes²

General specifications

- Chemical formula: CaCO₃

- Specific Gravity: 2.72–2.78

- Particle size: 60 US Mesh (90% WT)

Calcium Carbonate: Coarse Flakes³

General specifications

- Chemical formula: CaCO₃

- Specific Gravity: 2.72–2.78

- Particle size: 12 US Mesh (80–90% WT)

Oil & Gas applications

- Bridging agent to control loss circulation
- Weighting agent in drilling fluids

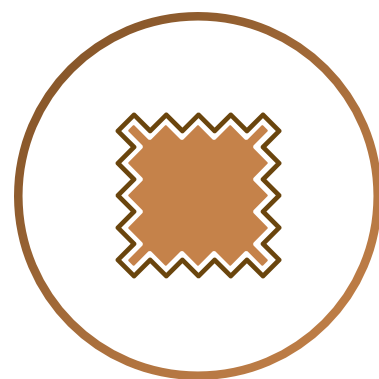
Other applications

- Fillers for cement and concrete
- Additive and support material for catalysts
- Additives in plastic production
- Pigment extender and fillers in paints and coatings
- Thickener in adhesives and sealings

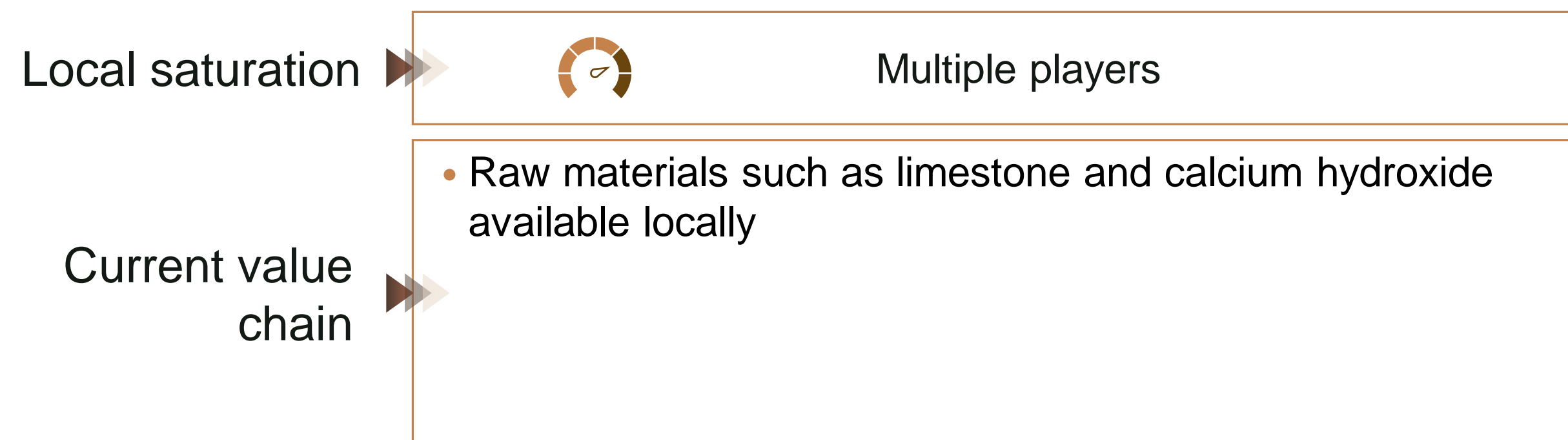
Catalyzing Supply Chains

1. Aramco material number 1000813534 2. Aramco material number 1000813690 3. Aramco material number 1000813535
Source: Expert interviews, Saudi Aramco analysis, team analysis

Value chain and key localization opportunities



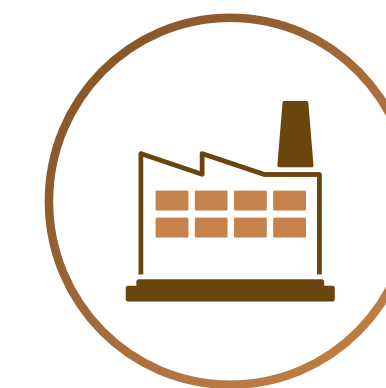
Raw materials



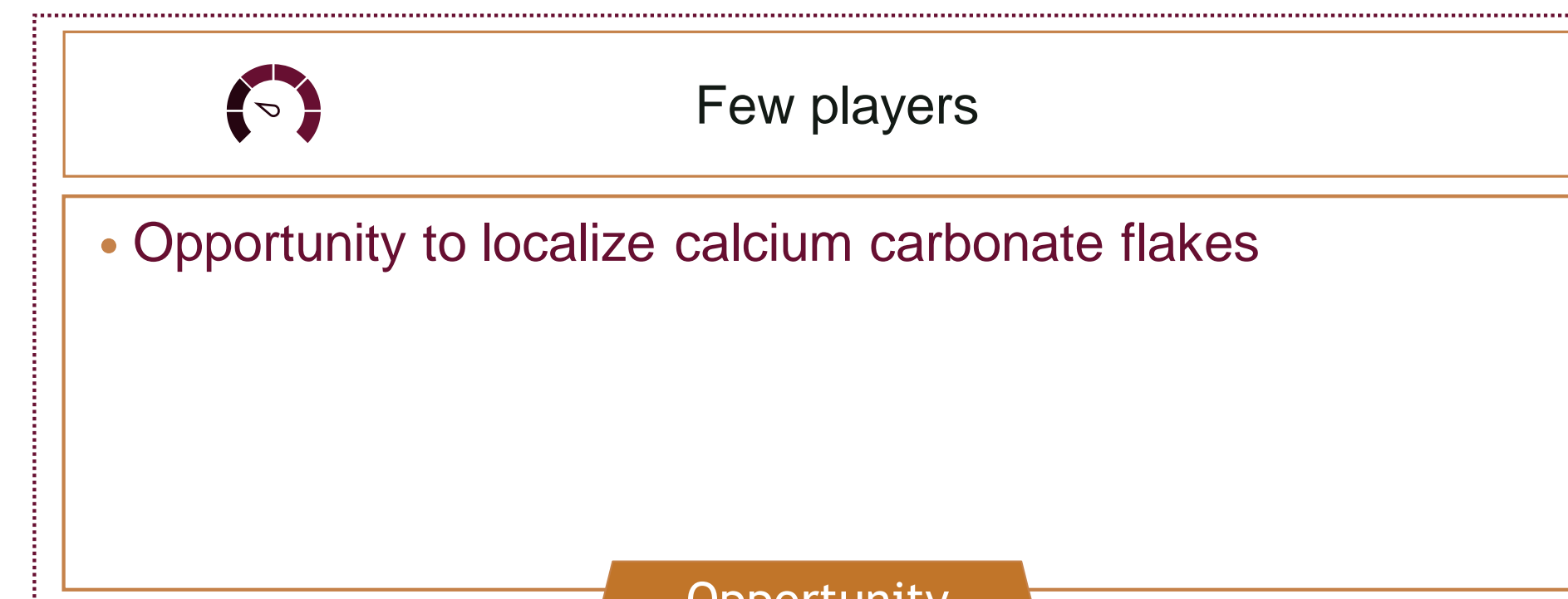
Success factors

Technology

Labor



Product formulation



Opportunity

- Precision grinding and particle size control technology

- Engineer with expertise in process engineering and material science

Drilling Chemicals workshop

Synthetic lubricants

Business Opportunity

Opportunity profile

1

High need for synthetic lubricants to realize oil & gas expansion plans and growing demand in automotive sector

2

Synthetic lubricants market is sizeable with significant forecasted growth

3

Attractive investment opportunities in the synthetic lubricant value chain

Type(s)

Extreme Lubricants (FattyAcids/ Polyol Ester)	Specific gravity: 0.95–1.05
Ester based lubricants	Specific gravity: 1.1

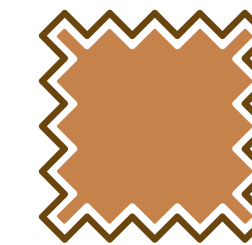


Estimated 2024 KSA market size

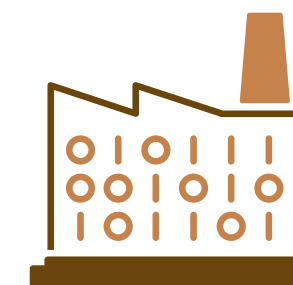


Forecasted 5-year CAGR

KSA value chain opportunities



Raw material



Product formulation

Catalyzing Supply Chains

Technical overview

Extreme Lubricants (Fatty Acids/ Polyol Ester)¹

General specifications

- Specific gravity: 0.95–1.05

- Form: Yellow to dark amber liquid

- Insoluble in water

Ester based lubricants²

General specifications

- Specific Gravity: 1.1

- Form: Colorless odorless liquid

- Water soluble

Oil & Gas applications

- Reduction in torque and drag
- Enhanced wear protection

Other applications

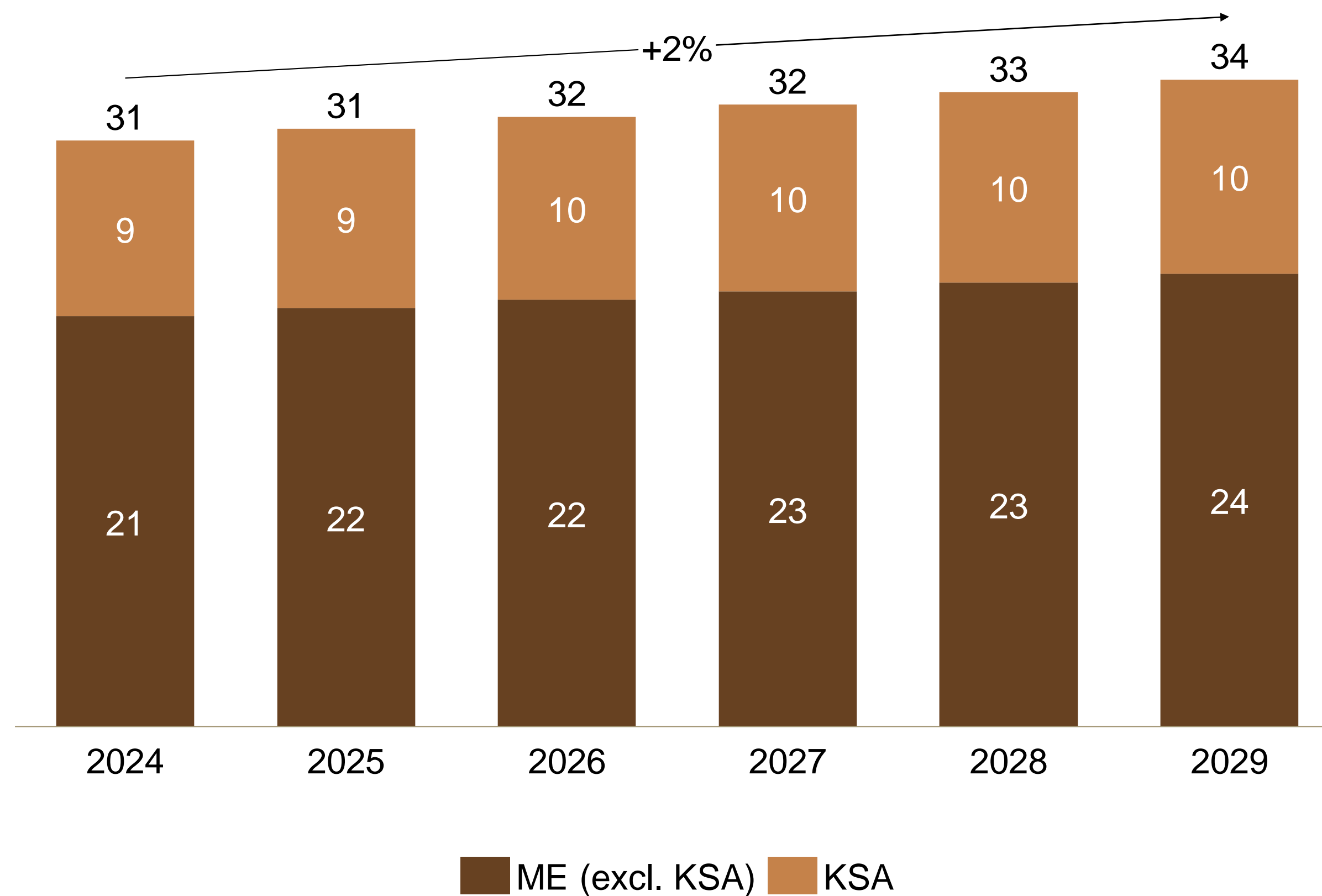
- Engine oil and hydraulic fluid in marine and automotive industry

Catalyzing Supply Chains


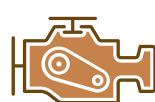
1. Aramco material number 1001130337, 2. Aramco material number 1000757580
Source: Expert interviews, Saudi Aramco analysis, team analysis

Synthetic lubricants demand, customers, and drivers

Forecasted Middle East synthetic lubricants¹ market 2024-2029 (\$MM)



Typical customers in KSA

-  Oil & Gas players
-  Shipping & automotive sector

Key KSA demand drivers

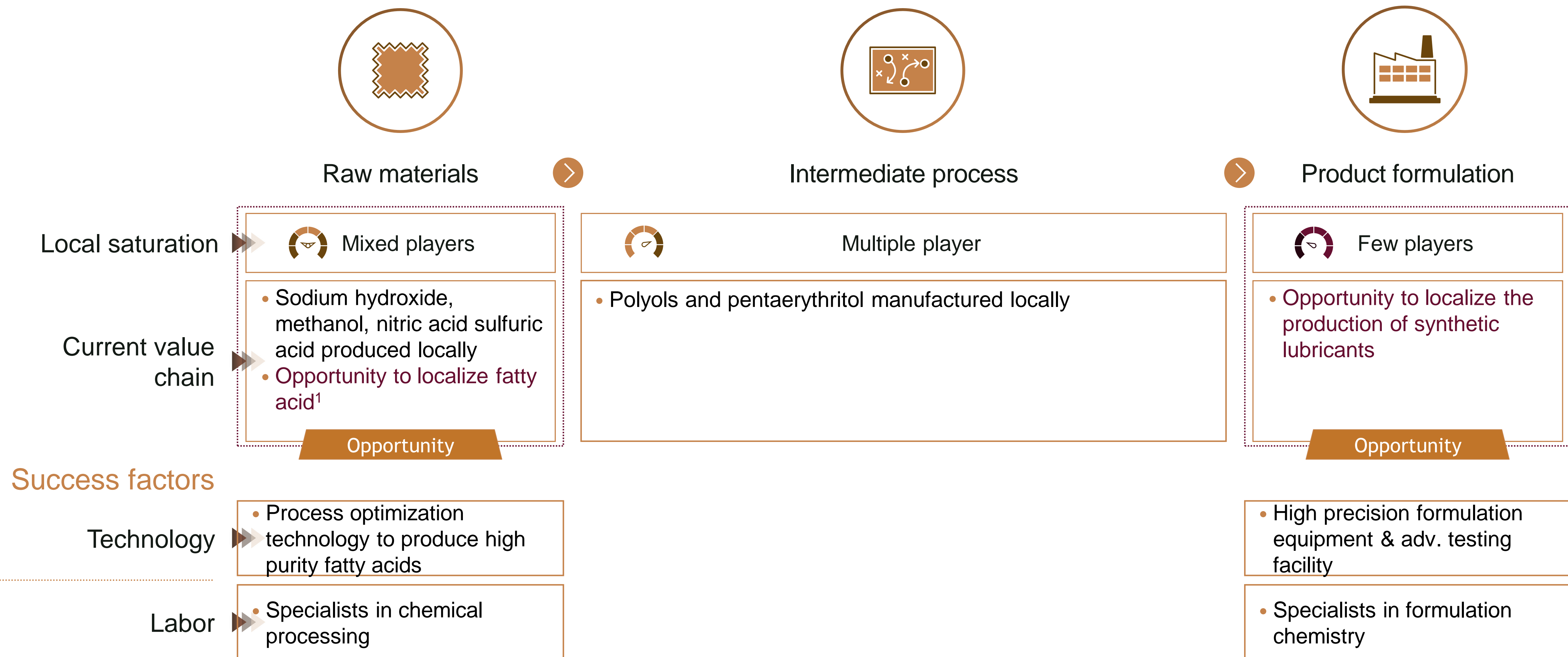
- **Consumer industry demand:** Steady demand for lubricants used in machinery to prevent wear and tear across key industries

Drilling Chemicals workshop

Catalyzing Supply Chains

1. Including only ester based and fatty acid based
Source: S&P global commodity insights, expert interviews, team analysis

Value chain and key localization opportunities



Drilling Chemicals workshop

Catalyzing Supply Chains

1. Oleic acid, linoleic acid are some examples
Source: Expert interviews, team analysis

Polyanionic Cellulose (PAC)

Business Opportunity

Opportunity profile

1

PAC production is necessary to realize ongoing expansion plans in O&G

2

PAC is a niche market with steady forecasted growth

3

Attractive investment opportunities in the PAC value chain

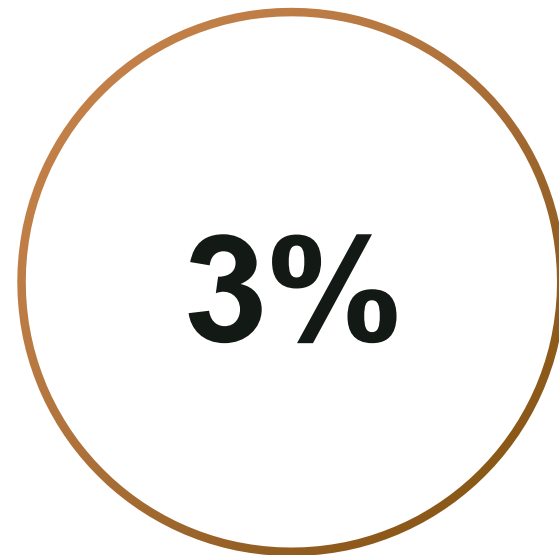
Type(s)

Polyanionic cellulose—regular & low viscosity

Specific gravity: 1.4-1.5

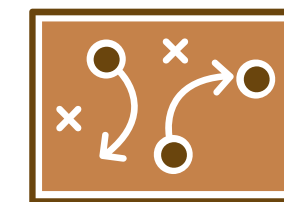


Estimated 2024 KSA market size

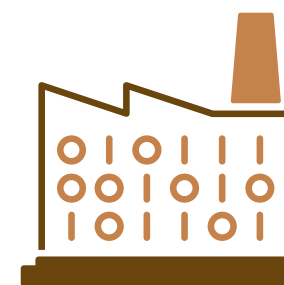


Forecasted 5-year CAGR

KSA value chain opportunities



Intermediate process



Product formulation

Catalyzing Supply Chains

Technical overview

Polyanionic cellulose – Regular¹ & Low viscosity²

General specifications

- Specific Gravity: 1.4 – 1.5
- Form: White / off white granular powder
- Highly soluble in water

Oil & Gas applications

- Filtration control in drilling mud
- Rheology stabilizer
- Shale formation inhibitor
- Supplementary viscosifier

Other applications

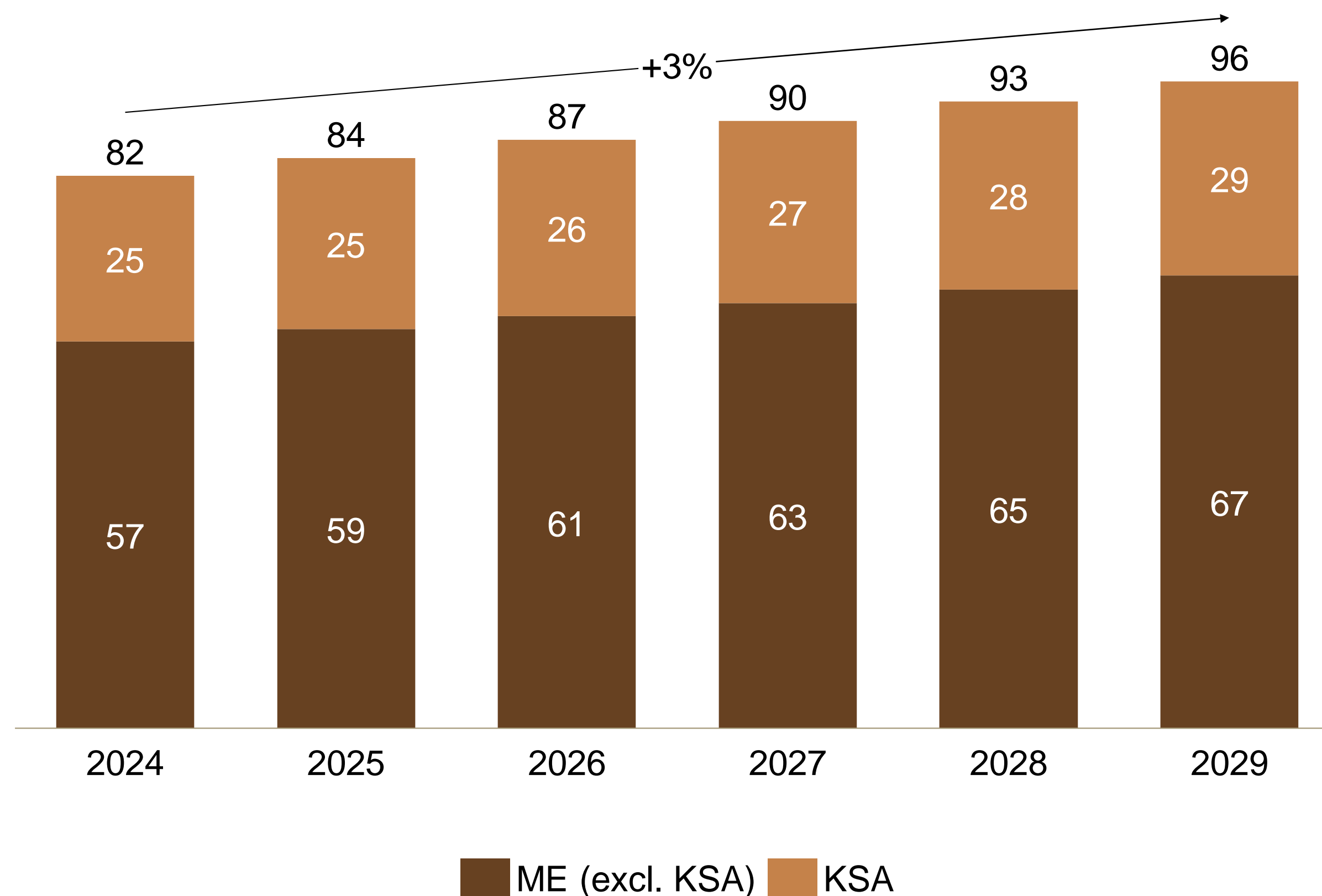
- Water treatment solutions

Catalyzing Supply Chains

1. Aramco material number:1000021605, 2. Aramco material number: 1000758662
 Source: Expert interviews, Saudi Aramco analysis, team analysis

PAC demand, customers, and drivers

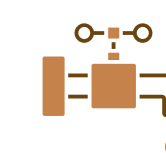
Forecasted Middle East PAC market 2024-2029 (\$MM)



Typical customers in KSA



Oil & Gas players



Municipal & industrial wastewater treatment

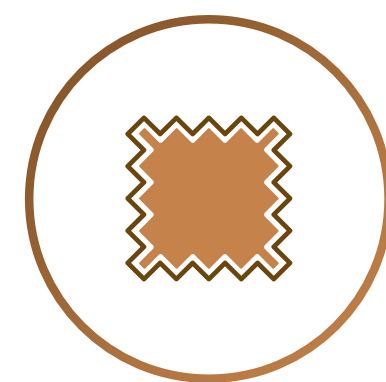
Key KSA demand drivers

- **Consumer industry growth:** Oil well expansion plans leading to increased demand for PAC as a drilling fluid additive
- **Sustainability and environment regulations:** KSA ambition for 100% usage of treated wastewater leads to growing demand for PAC used in wastewater treatment

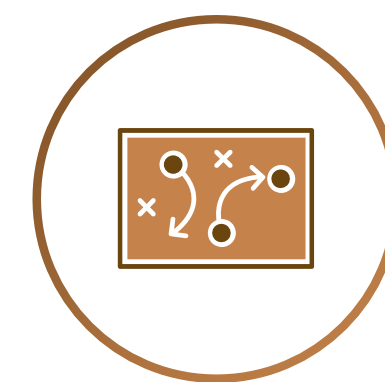
Drilling Chemicals workshop

Catalyzing Supply Chains

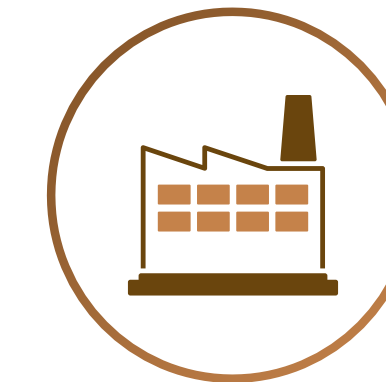
Value chain and key localization opportunities



Raw materials



Intermediate process



Product formulation

Local saturation



No players

Current value chain

- Raw materials such as wood pulp and cotton not localized due to climatic conditions



Few players

- Opportunity to localize cellulose sourcing and processing



Few players

- Opportunity to localize polyanionic cellulose

Opportunity

Opportunity

Success factors

Technology



- Cellulose extraction technology

- Advanced reactors and control systems

Labor



- Biochemical engineers for enzymatic hydrolysis process

- Engineers with expertise in polymer science & control systems

Catalyzing Supply Chains

Drilling Chemicals workshop

Hydroxyethyl Cellulose

Business Opportunity

Opportunity profile

1

KSA in need of hydroxyethyl cellulose for growing industrial manufacturing and O&G sectors

Type(s)

Hydroxy Ethyl Cellulose

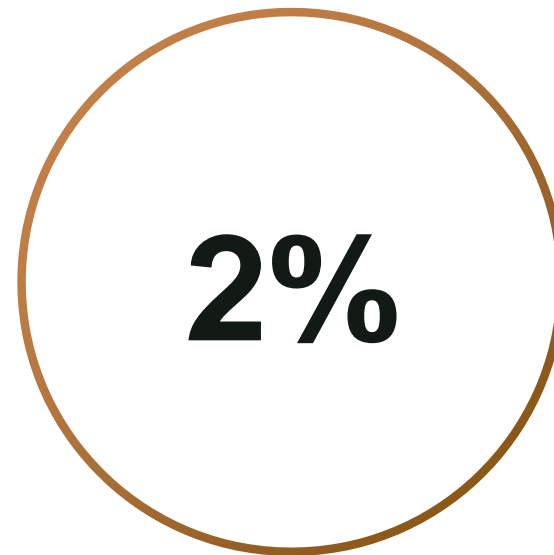
Specific gravity: 1.38-1.4

2

Hydroxy ethyl cellulose market is expected to remain stable



Estimated 2024 KSA market size

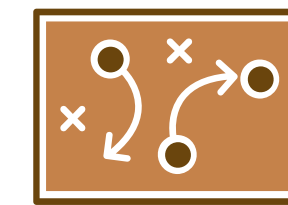


Forecasted 5-year CAGR

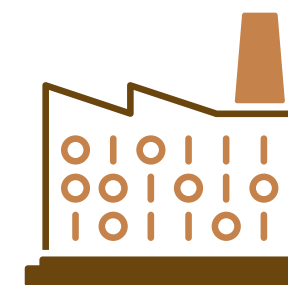
3

Attractive investment opportunities in for the HEC value chain

KSA value chain opportunities



Intermediate process



Product formulation

Catalyzing Supply Chains

Technical overview

Hydroxy Ethyl Cellulose¹

General specifications

- Chemical formula: $(C_2H_6O_2)_n$

- Specific gravity: 1.38–1.4

- Form: Dry white powder

Oil & Gas applications

- Viscosity controller for complex brine systems
- Fluid loss controller in water-based drilling

Other applications

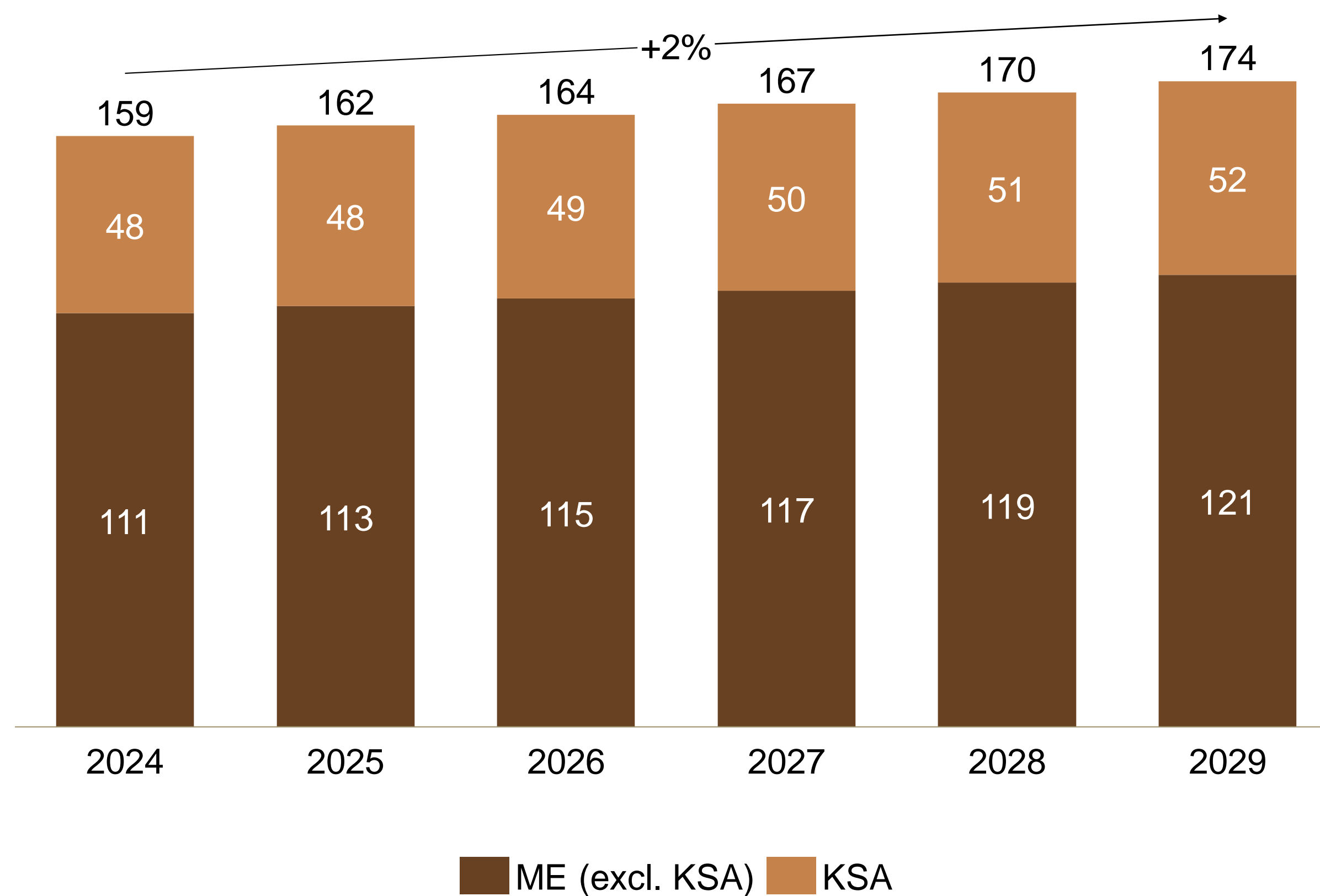
- Rheology modifier for water-based paints
- Thickener for paints and coatings
- Cement mortar water retention
- Paper manufacturing
- Tile adhesives
- Cosmetics

Catalyzing Supply Chains



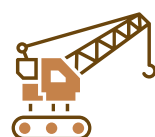
1. Aramco material numbers 1000021672
 Source: Expert interviews, Saudi Aramco analysis , Team Analysis

Hydroxyethyl cellulose (HEC) demand, customers, and drivers

Forecasted Middle East HEC market 2024-2029 (\$MM)



Typical customers in KSA

-  Oil & Gas players
-  Industrial manufacturers
-  Construction industry

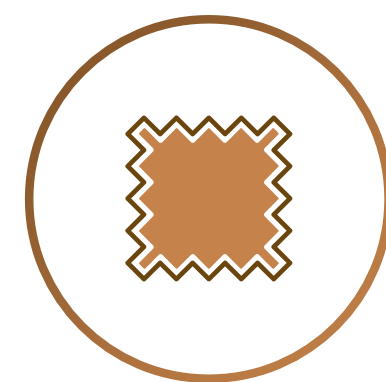
Key KSA demand drivers

- **Consumer Industry demand:** Increase in oil production leads to increased need for fluid loss and viscosity controller such as HEC
- **Economic drivers:** Increase in need for paints and coatings driven by Vision 2030 megaprojects and growth in non-oil sectors could lead to an increased demand for HEC used as raw material for water-based paints

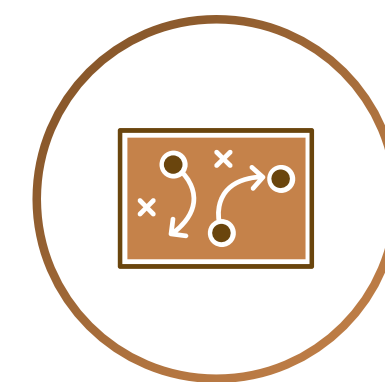
Drilling Chemicals workshop

Catalyzing Supply Chains

Value chain and key localization opportunities



Raw materials



Intermediate process



Product formulation

Local saturation



No players

Current value chain

- Raw materials such as wood pulp and cotton not localized due to climatic conditions



Mixed players

- Ethylene oxide and sodium hydroxide manufactured locally
- Opportunity to localize cellulose sourcing and processing



Few players

- Opportunity to localize production of hydroxyethyl cellulose

Opportunity

Opportunity

Success factors

Technology



- Cellulose sourcing and processing infrastructure and machinery

- Formulation technology and R&D testing facilities

Labor



- Chemical engineers and process technicians

- Engineers with expertise in polymer science & control systems

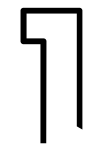
Catalyzing Supply Chains

Drilling Chemicals workshop

Sodium Bromide Solution

Business Opportunity

Opportunity profile



KSA in high need of sodium bromide to realize ongoing O&G expansion plans



Sodium bromide market is expected to see moderate growth



Attractive investment opportunities in the sodium bromide value chain

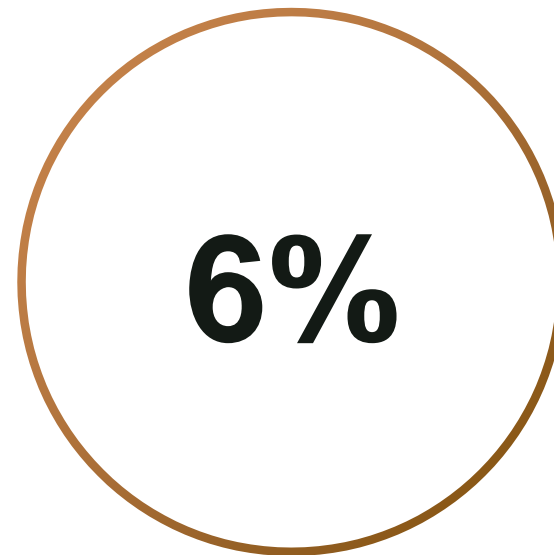
Type(s)

Sodium bromide

Specific gravity:
1.46

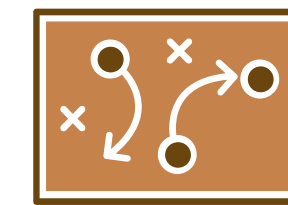


Estimated 2024 KSA market size

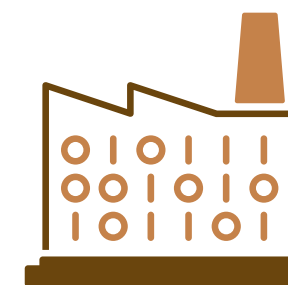


Forecasted 5-year CAGR

KSA value chain opportunities



Intermediate process



Product formulation

Technical overview

Sodium Bromide¹

General specifications

- Chemical Formula: NaBr
- Specific Gravity: 1.46
- Form: Colorless liquid

Oil & Gas applications

- Completion fluid due to its ability to create high density brine solution
- Used as a weighting agent

Other applications

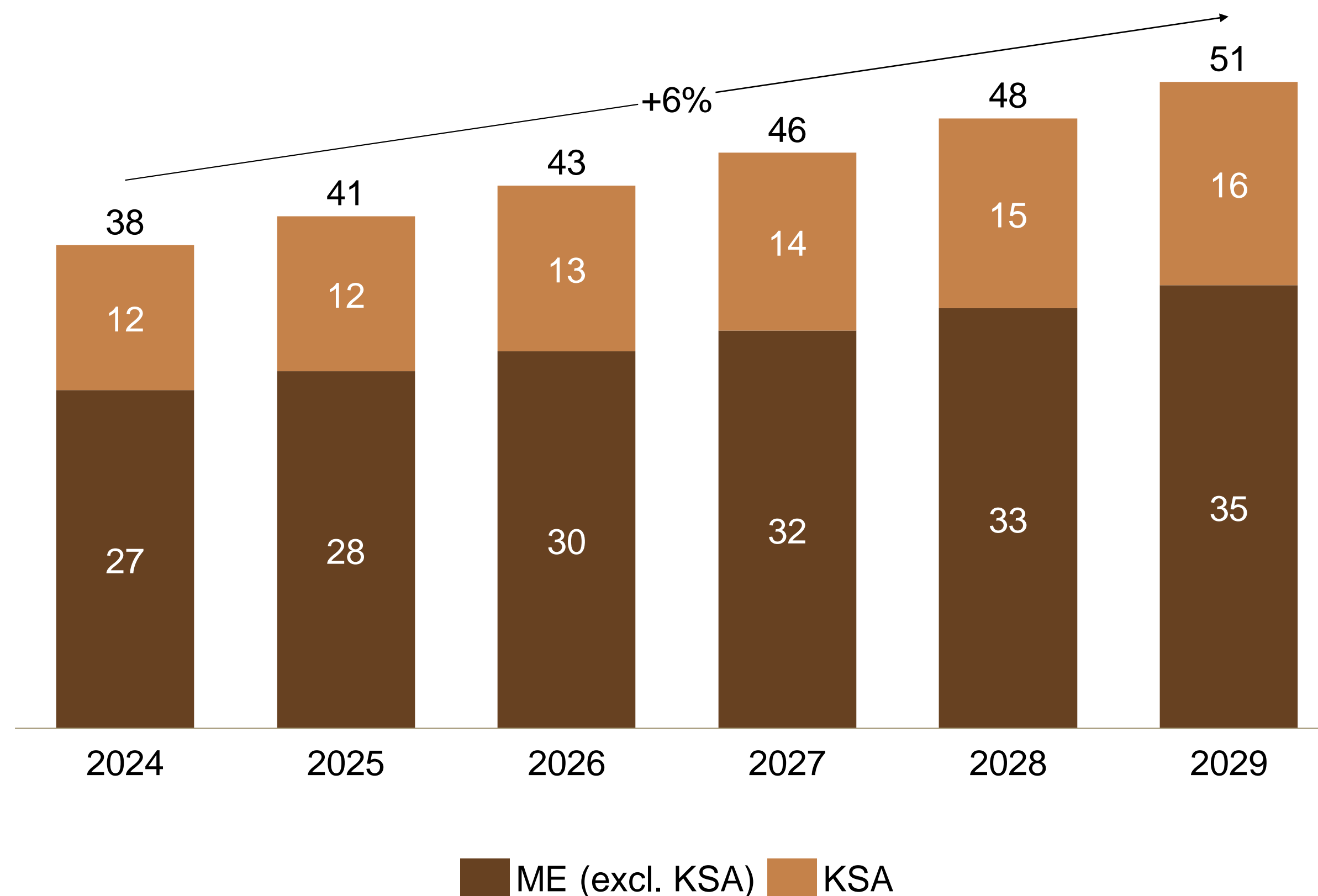
- Water treatment and bromination
- Production of flame retardants
- Textile dyeing

Catalyzing Supply Chains

1. Aramco material number 1000847075
Source: Expert interviews, Team analysis

Sodium bromide demand, customers, and drivers

Forecasted Middle East sodium bromide market 2024-2029 (\$MM)



Typical customers in KSA



Oil & Gas players

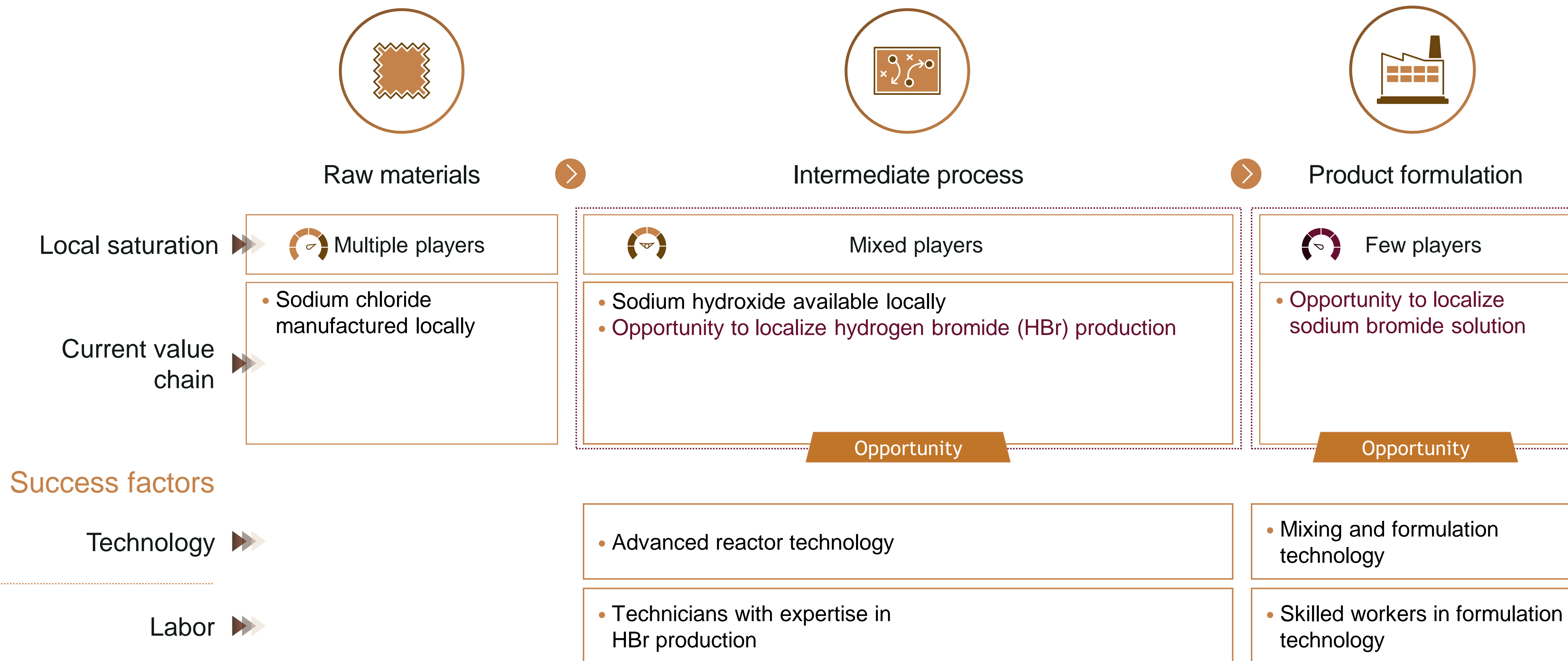


Industrial manufacturers

Key KSA demand drivers

- **Consumer industry growth:** Increased oil and gas production leads to an increase in demand for weighting agents such as sodium bromide used in high pressure wells
- **Sustainability drivers:** KSA ambition to achieve 100% treatment of wastewater drives demand for sodium bromide used as disinfectant in cooling towers and treatment of industrial water

Value chain and key localization opportunities



Drilling Chemicals workshop

Catalyzing Supply Chains

Sulphonated Asphalt

Business Opportunity

Opportunity profile



KSA in high need of sulphonated asphalt to realize ongoing O&G expansion plans



Sulphonated asphalt is a niche market is with significant forecasted growth



Attractive investment opportunities in the sulphonated asphalt value chain

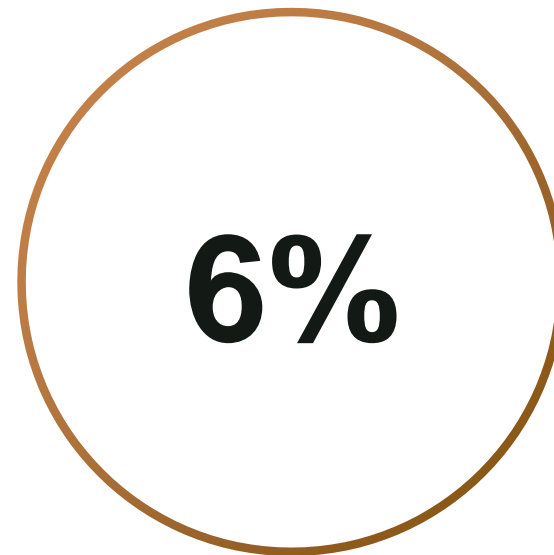
Type(s)

Sulphonated Asphalt

Specific gravity: 1.1-1.3

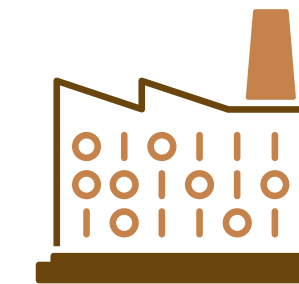


Estimated 2024 KSA market size



Forecasted 5-year CAGR

KSA value chain opportunities



Product formulation

Technical overview

Sulphonated Asphalt¹

General specifications

- Specific Gravity: 1.1 – 1.3

- Form: Dark brown to black powder or flakes

Oil & Gas applications

- Fluid loss control agent
- Reduce torque and drag
- Shale stabilization
- Hydraulic fracturing

Other applications

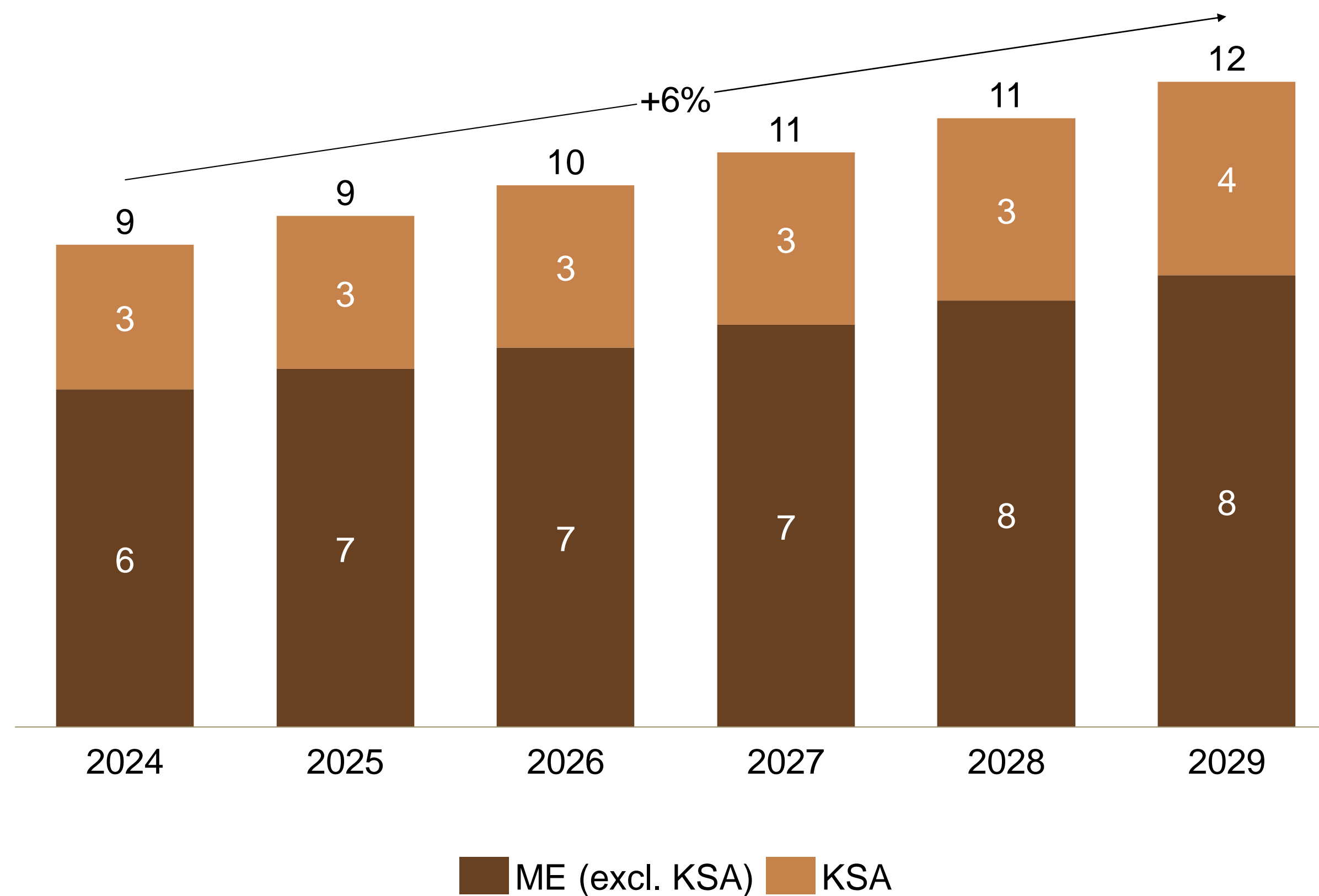
- Additive in road construction

Catalyzing Supply Chains

1. Aramco material numbers 1000021607
 Source: Expert interviews, Saudi Aramco analysis , Team Analysis

Sulphonated asphalt demand, customers, and drivers

Forecasted Middle East sulphonated asphalt market 2024-2029 (\$MM)



Typical customers in KSA



Oil & Gas players

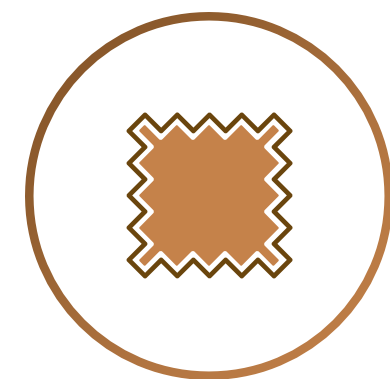
Key KSA demand drivers

- **Industry demand:** Growing expansion plans in upstream oil and gas production expected to drive demand for sulphonate asphalt used as fluid loss control agent and lubricant
- **Rise in production capacity:** Rise in targeted daily oil production through 2027 expected to drive demand for sulphonated asphalt

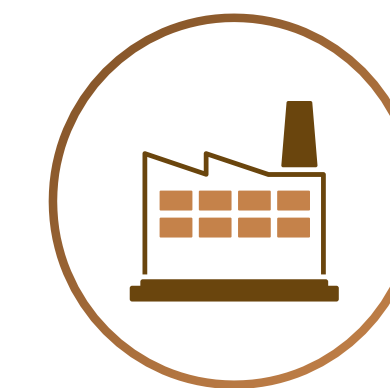
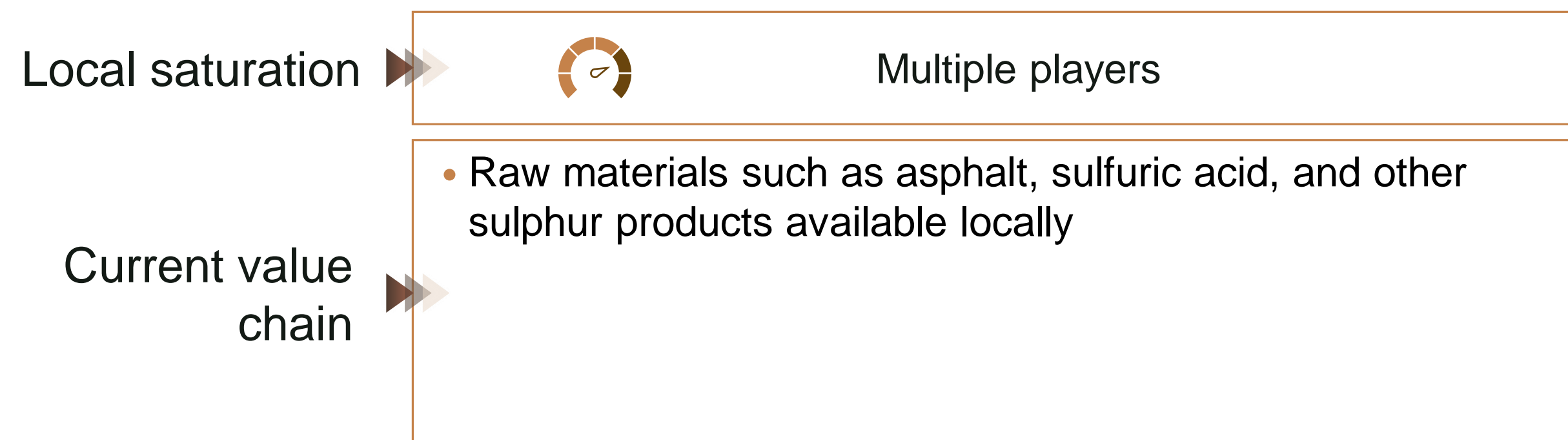
Drilling Chemicals workshop

Catalyzing Supply Chains

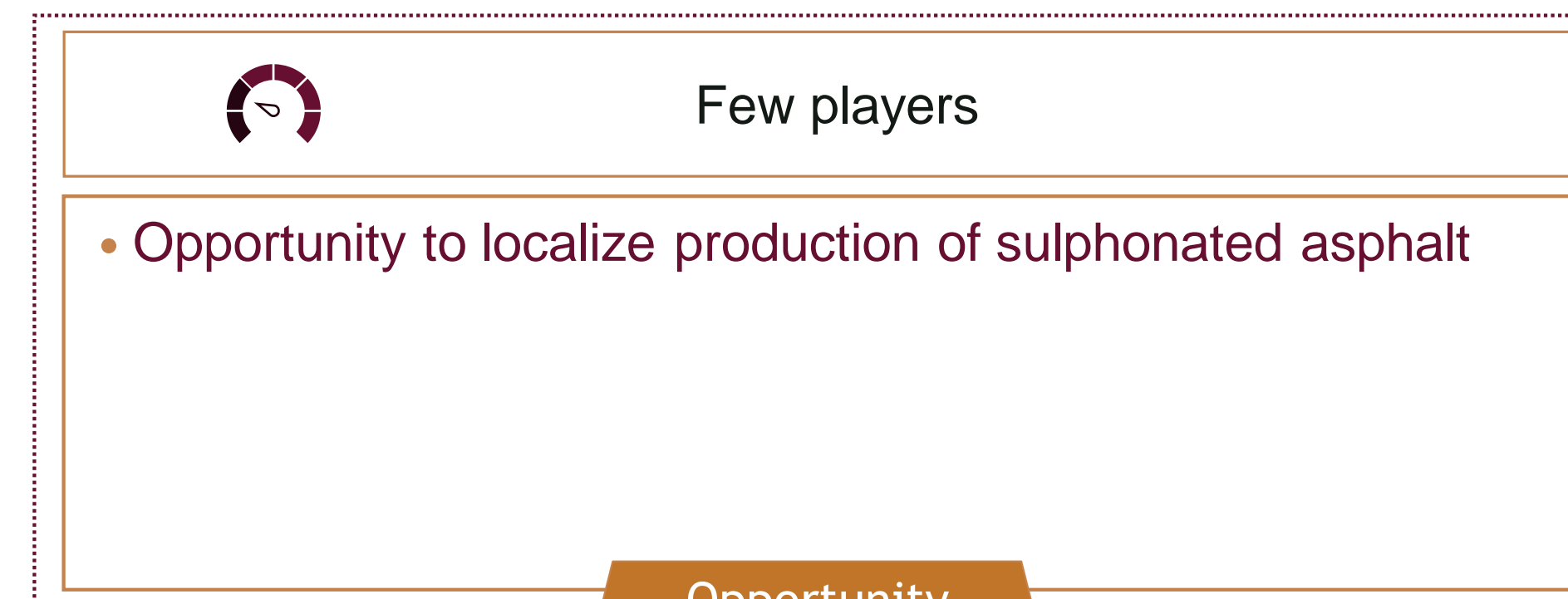
Value chain and key localization opportunities



Raw materials



Product formulation



Opportunity

- Advanced reaction control systems and corrosion resistant reactors

- Chemical engineers with expertise in sulphonation reactions

Success factors

Technology ▶▶▶

Labor ▶▶▶

Catalyzing Supply Chains

Synthetic Graphite

Business Opportunity

Opportunity profile

1

KSA in need of synthetic graphite to realize its O&G expansion plans and industrial diversification strategy

2

Synthetic graphite market is expected to show moderate growth

3

Attractive investment opportunities in for the synthetic graphite value chain

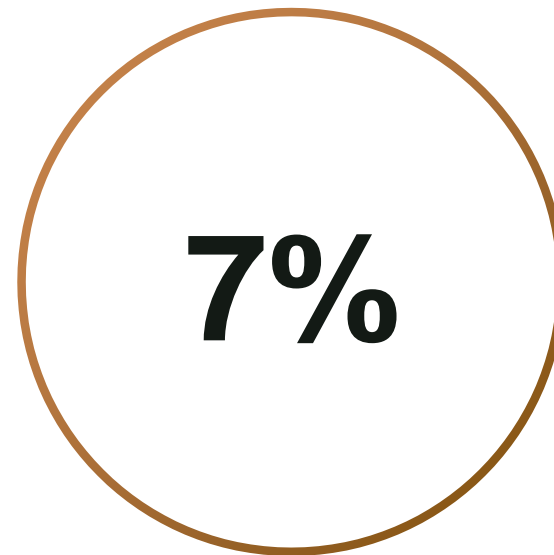
Type(s)

Synthetic graphite

Specific gravity: 1.5-1.8

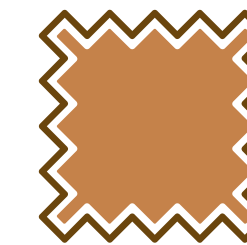


Estimated 2024 KSA market size

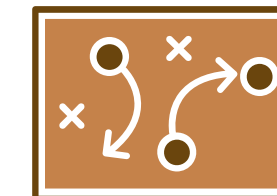


Forecasted 5-year CAGR

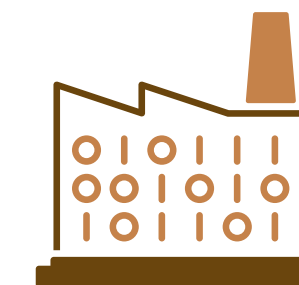
KSA value chain opportunities



Raw material



Intermediate process



Product formulation

Technical overview

Synthetic graphite¹

General specifications

- Specific Gravity: 1.5 – 1.8
- Form: Grey to black graphite form

Oil & Gas applications

- Lubricant in high temperature drilling
- Loss circulation material
- Wellbore stabilization
- Agent to reduce differential sticking

Other applications

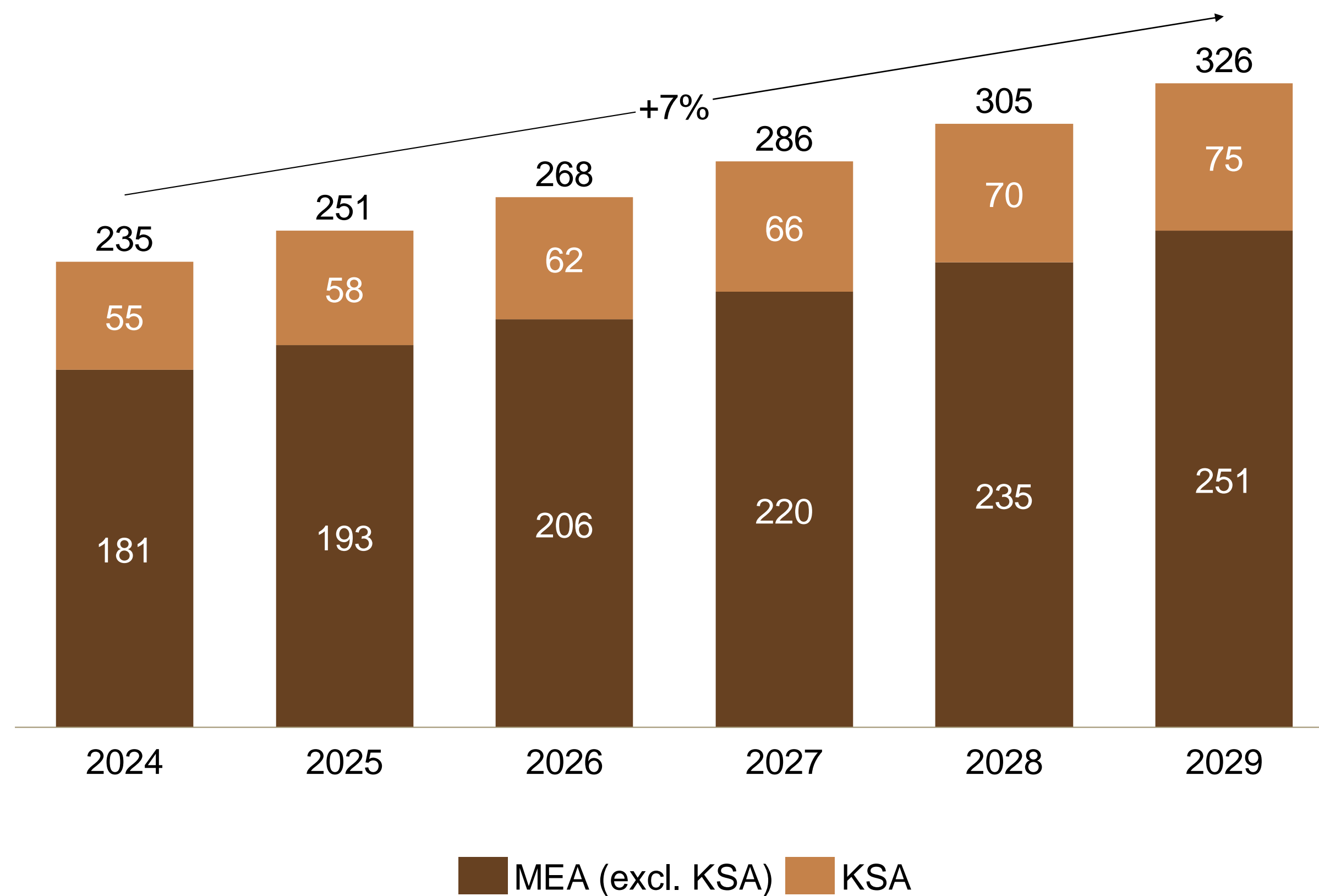
- Steel and aluminum production
- Seals and gaskets
- Specialty lubricants for industrial applications
- Energy storage and battery manufacturing

Catalyzing Supply Chains




1. Aramco material numbers 1001077679
Source: Expert interviews, Team Analysis

Synthetic graphite demand, customers, and drivers

Forecasted Middle East & Africa synthetic graphite market 2024-2029 (\$MM)



Typical customers in KSA

-  Oil & Gas players
-  Metals and mining industry
-  Automotive industry

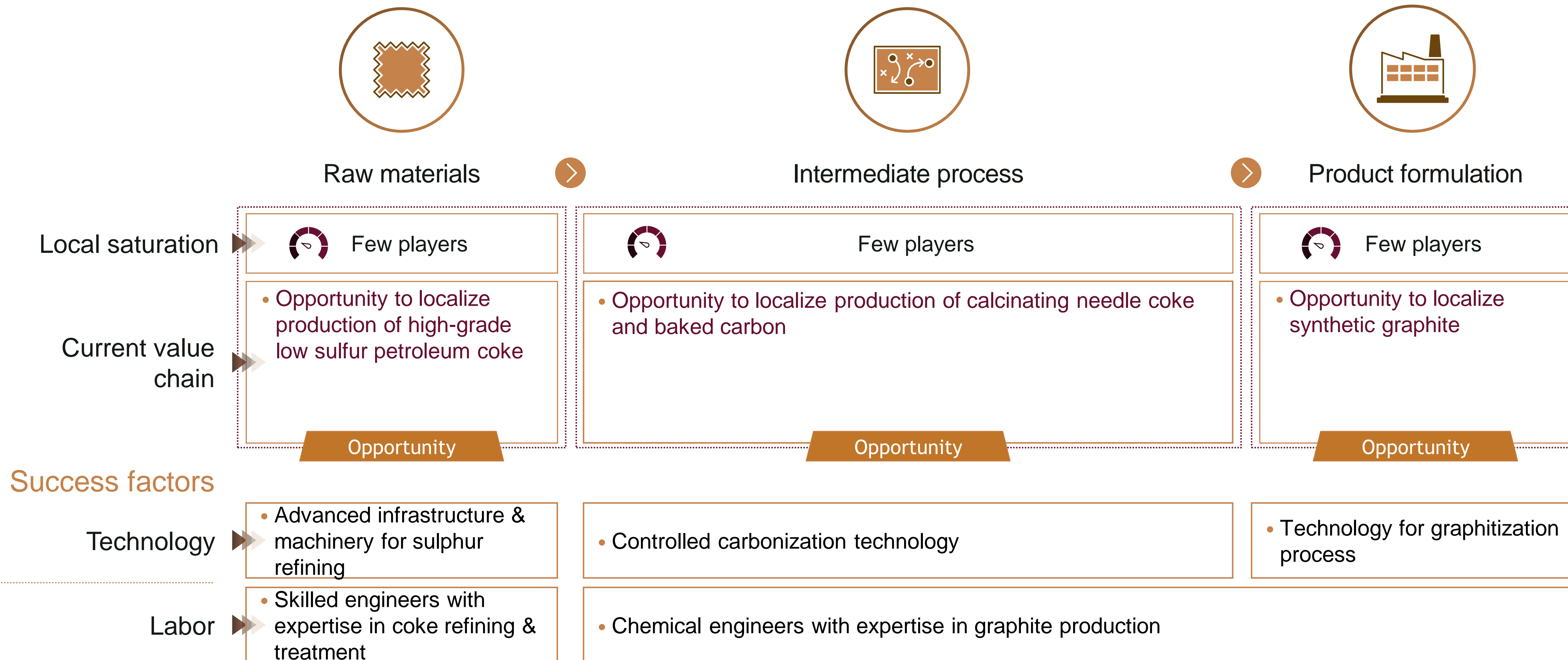
Key KSA demand drivers

- **Industry demand:** Growth in oil wells and production rates drive demand for synthetic graphite as LCM
- **Economic drivers:** Increased growth in new industries such as EV battery production and increased metallurgical processes expected to grow demand for synthetic graphite, a key raw material

Catalyzing Supply Chains

Notes: LCM = Loss circulation material
Source: Mordor Intelligence, expert interviews, Saudi Aramco data, team analysis

Value chain and key localization opportunities



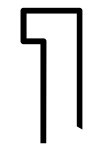
Drilling Chemicals workshop

Catalyzing Supply Chains

Manganese Tetroxide

Business Opportunity

Opportunity profile



KSA in need of manganese tetroxide for O&G expansion projects and industrial diversification strategy



Manganese tetroxide market is expected to grow moderately



Attractive investment opportunities in for the manganese tetroxide value chain

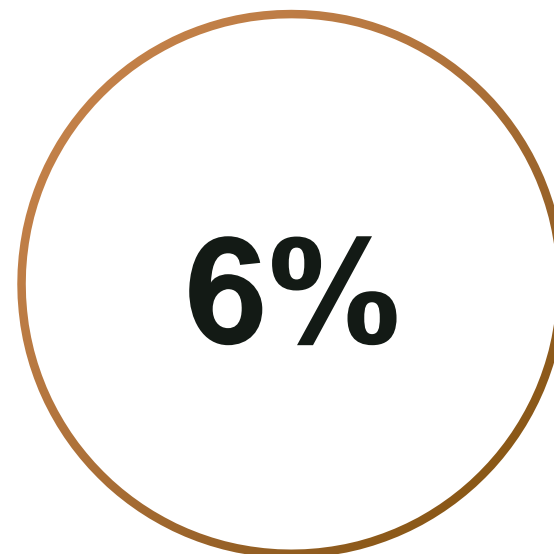
Type(s)

Manganese tetroxide

Specific gravity: 4.8

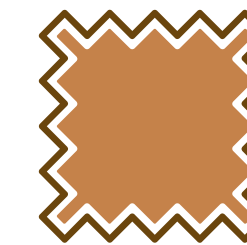


Estimated 2024 KSA market size

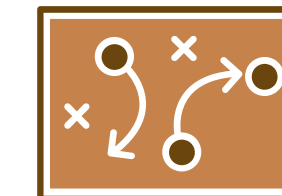


Forecasted 5-year CAGR

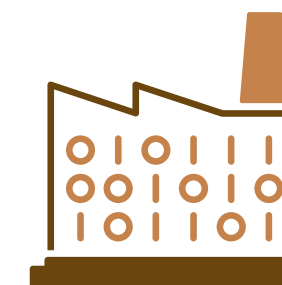
KSA value chain opportunities



Raw material



Intermediate process



Product formulation

Technical overview

Manganese tetroxide¹

General specifications

- Chemical formula: Mn_3O_4

- Specific Gravity: 4.8

- Form: Fine reddish-brown powder

Oil & Gas applications

- Weighting agent in drilling

Other applications

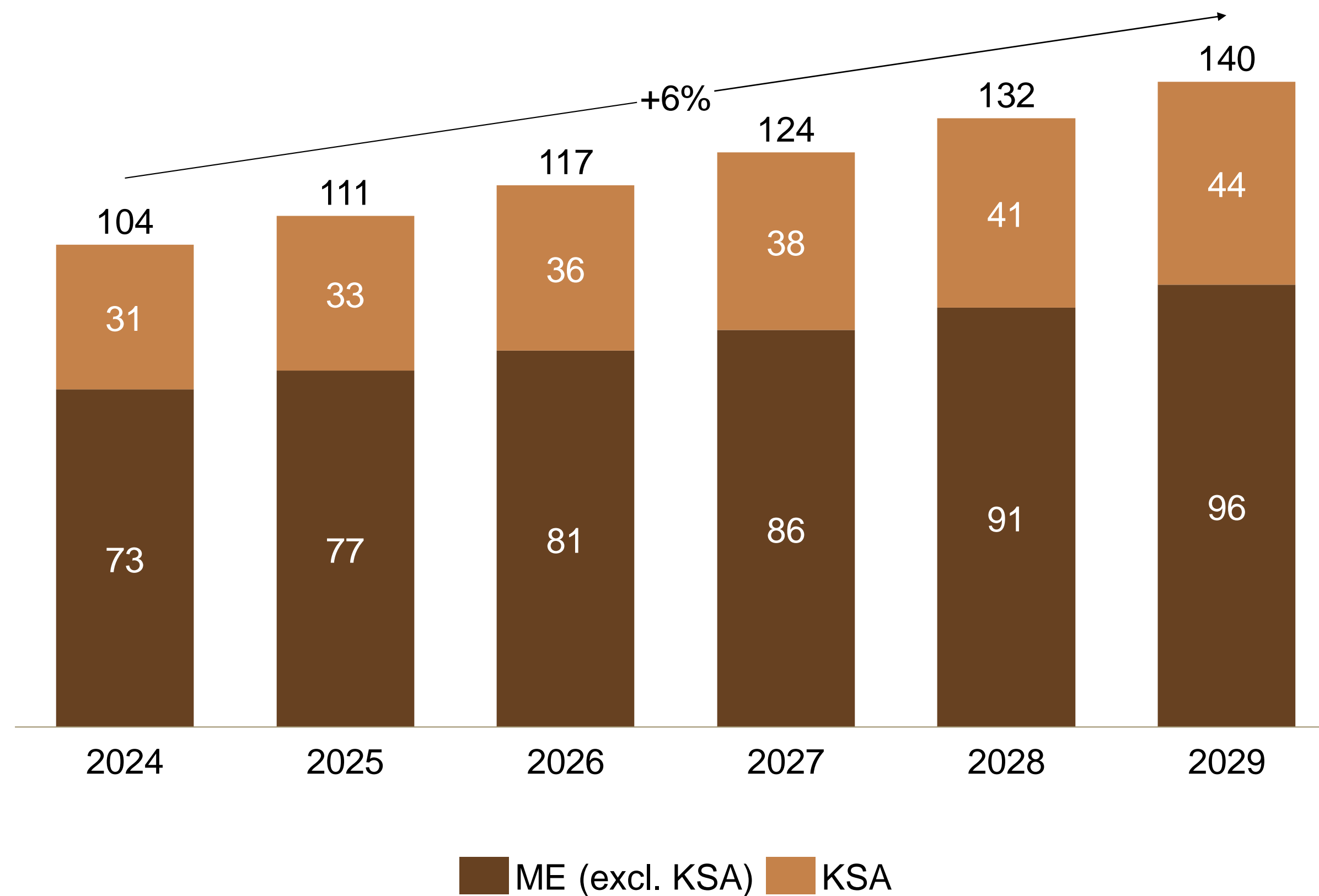
- Lithium battery for EV²
- Removes oxygen and sulphur in steel production

Catalyzing Supply Chains




1. Aramco material numbers 1000845612 2. Nascent market in KSA at present
 Source: Expert interviews, team analysis

Manganese tetroxide demand, customers, and drivers

Forecasted Middle East manganese tetroxide market 2024-2029 (\$MM)



Typical customers in KSA

-  Oil & Gas players
-  Battery manufacturing
-  Steel manufacturing

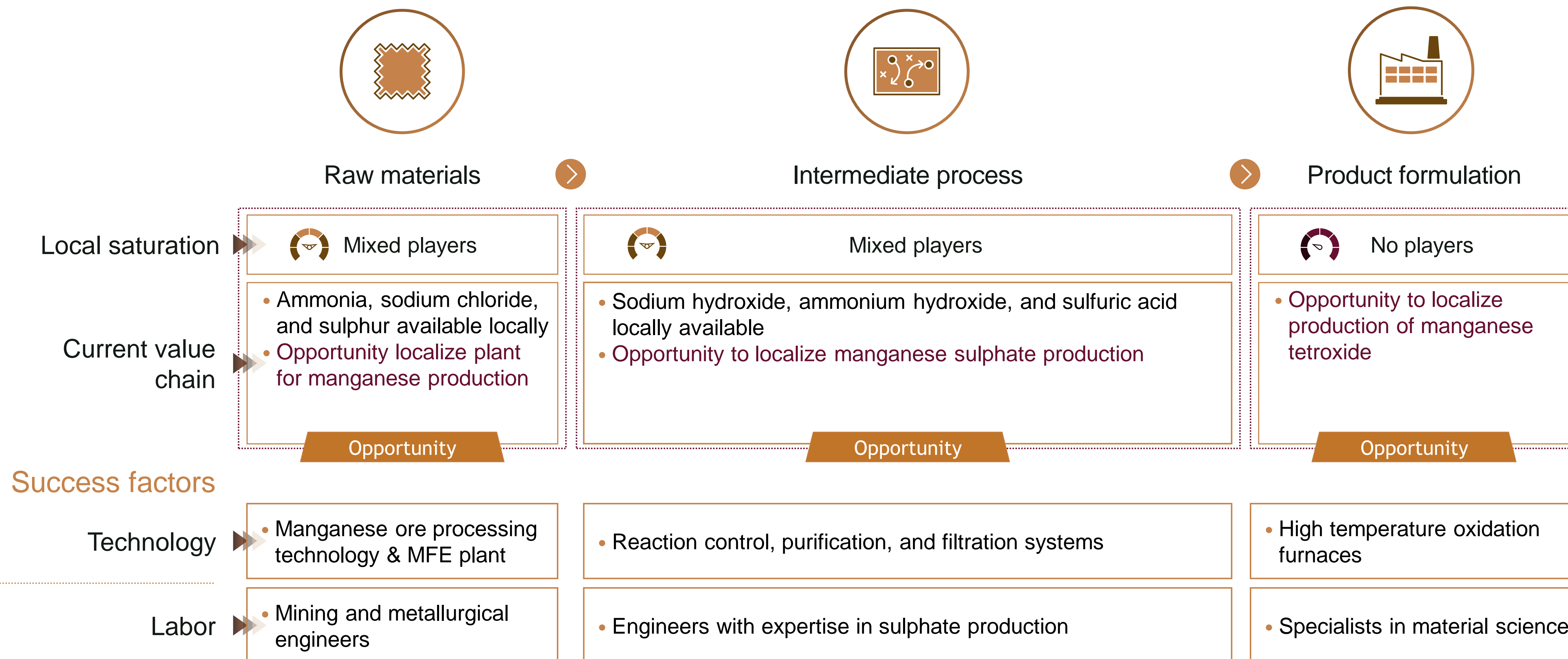
Key KSA demand drivers

- **Industry led growth:** Increase in oil production leads to growing demand for weighting agents such as Mn₃O₄ which is used to increase drilling fluid density for pressure drilling
- **Economic diversification:** Increased growth in new industries such as EV battery production and increased metallurgical processes expected to grow demand for Mn₃O₄, a key raw material

Drilling Chemicals workshop

Catalyzing Supply Chains

Value chain and key localization opportunities



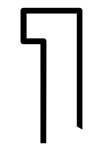
Catalyzing Supply Chains

Notes: MFE = Manufacturing
Source: Expert interviews, team analysis

**High temperature fluid loss
control polymer**

Business Opportunity

Opportunity profile



High need of HTFLCP to realize ongoing O&G expansion plans



HTFLCP market is niche with moderate growth expected



Attractive investment opportunities in the value chain

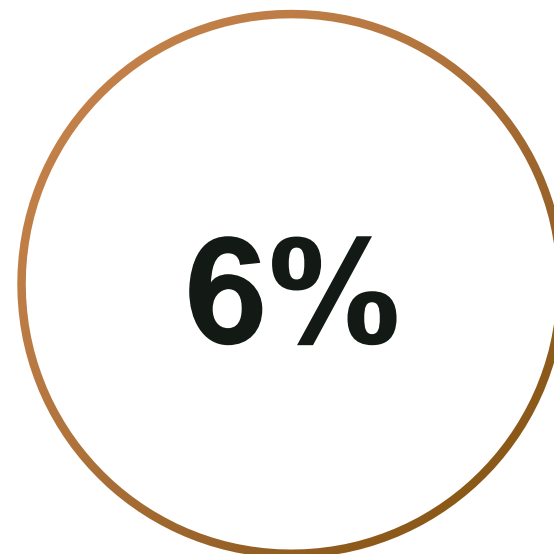
Type(s)

High temperature fluid loss control polymer

Specific gravity: 1.1-1.3

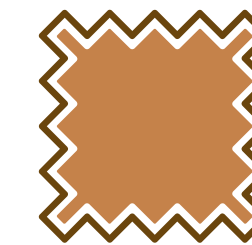


Estimated 2024 KSA market size

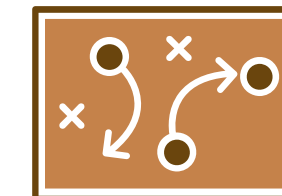


Forecasted 5-year CAGR

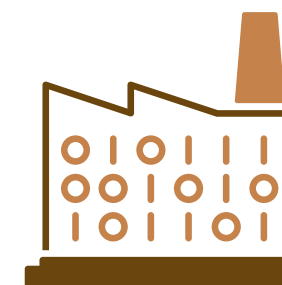
KSA value chain opportunities



Raw material



Intermediate process



Product formulation

Catalyzing Supply Chains

Note: HTFLCP = High temperature fluid loss control polymers
 Source: Expert interviews, Saudi Aramco data, team analysis

Technical overview

High temperature fluid loss control polymer¹

General specifications

- Type: Anionic acrylamide methylpropanesulfonic acid (AMPS)
- Specific Gravity: 1.1 – 1.3
- Form: White powder
- Does not hydrolyse

Oil & Gas applications

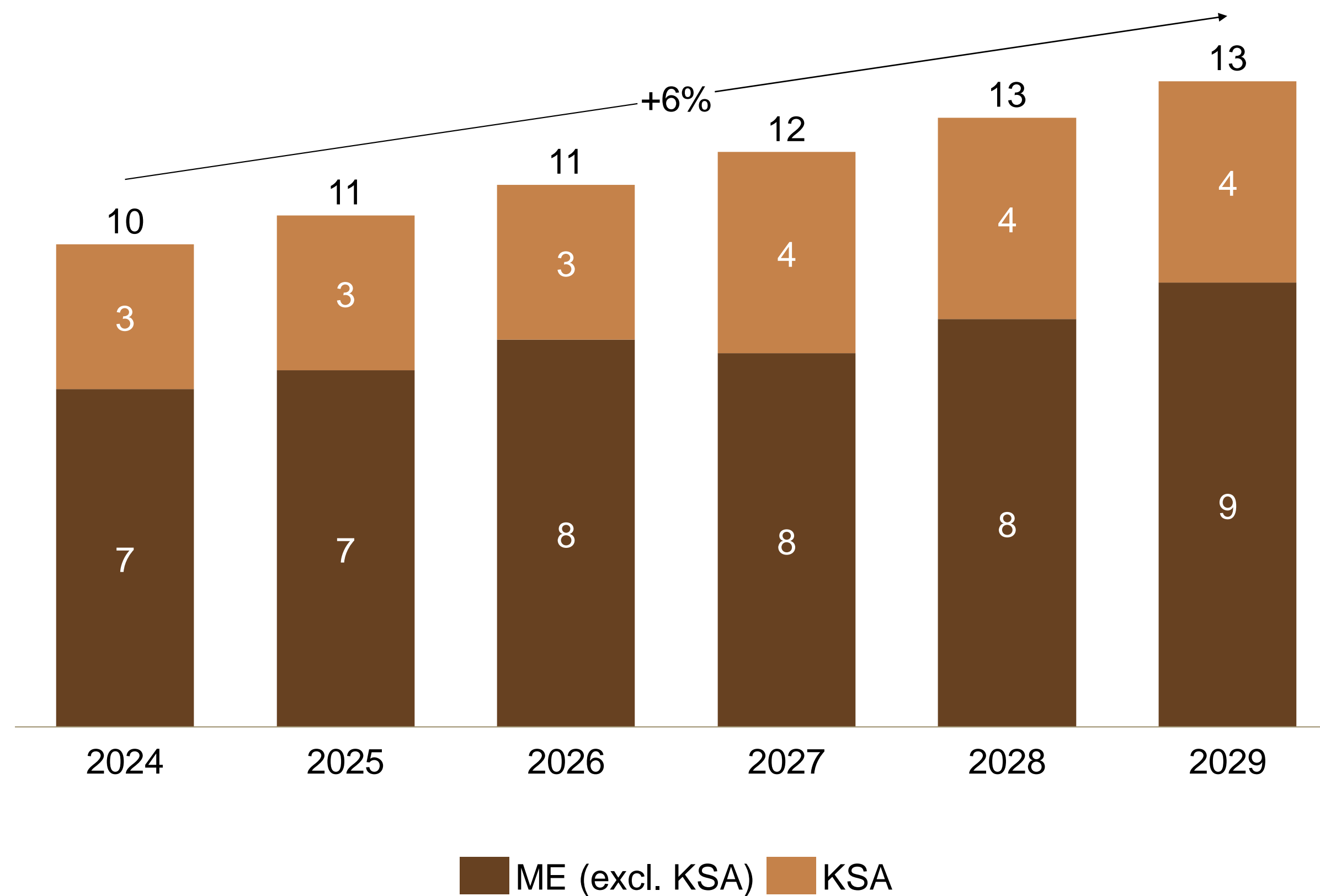
- Filtration control agent for all water-based muds
- Enhanced viscosity and gel strength
- Stabilizes shale formations

Catalyzing Supply Chains

1. Aramco material numbers 1000021602
Source: Expert interviews, team analysis

High temperature fluid loss control polymer demand, customers, and drivers

Forecasted Middle East high temperature fluid loss control polymer market 2024-2029 (\$MM)



Typical customers in KSA

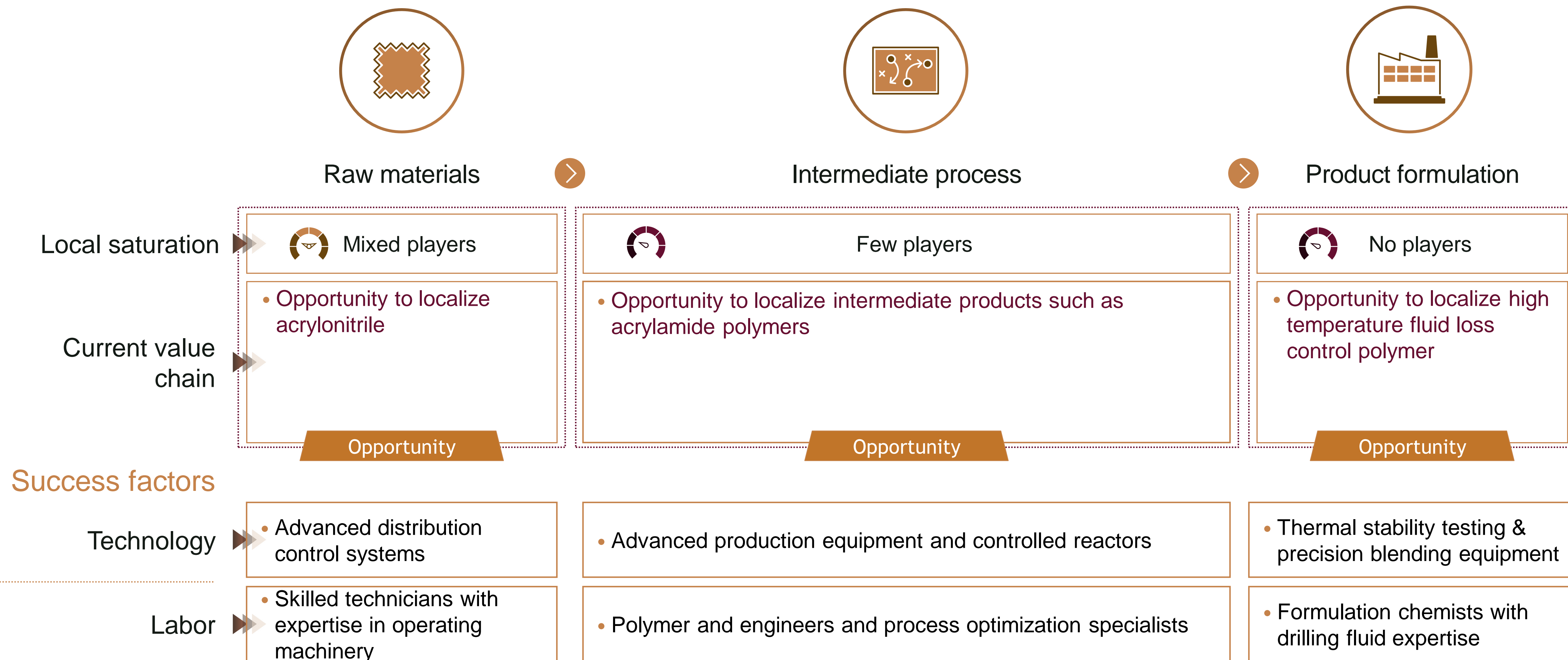
 Oil & Gas players

Key KSA demand drivers

- **Industry demand:** Growing O&G sector and future oil well expansion plans expected to drive demand for AMPS polymer used for high pressure drilling operations
- **Vision 2030 diversification strategy:** As economic diversification accelerates petchem production, demand for AMPS-based polymers is expected to grow given its crucial role in water management systems

Catalyzing Supply Chains

Value chain and key localization opportunities



Drilling Chemicals workshop

Catalyzing Supply Chains

**H₂S Scavenger zinc free iron
gluconate**

Business Opportunity

Opportunity profile



H2S Scavenger is in high need to meet the ongoing O&G expansion plans



H2S Scavenger market is expected to grow moderately in the next 5 years



Attractive investment opportunities in the H2S scavenger value chain

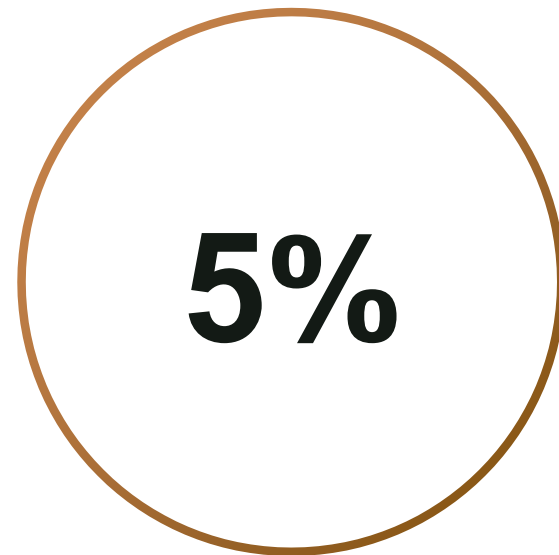
Type(s)

H2S scavenger
 zinc free iron
 gluconate

Specific gravity:
 1.2-1.3

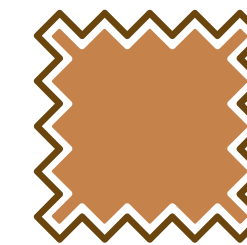


Estimated 2024
 KSA market size

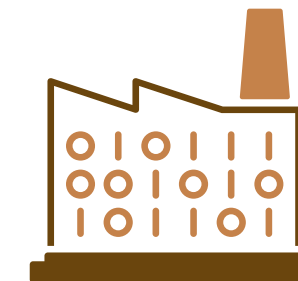


Forecasted 5-year
 CAGR

KSA value chain opportunities



Raw material



Product formulation

Technical overview

Zinc free iron gluconate H₂S Scavenger¹

General specifications

- Specific Gravity²: 1.2 – 1.3
- Form: Yellow-green powder
- Iron gluconate instead of zinc base
- Highly soluble in water

Oil & Gas applications

- Sour gas treatment agent
- Pipeline and tank protection
- Gas dehydration and sweetening

Other applications

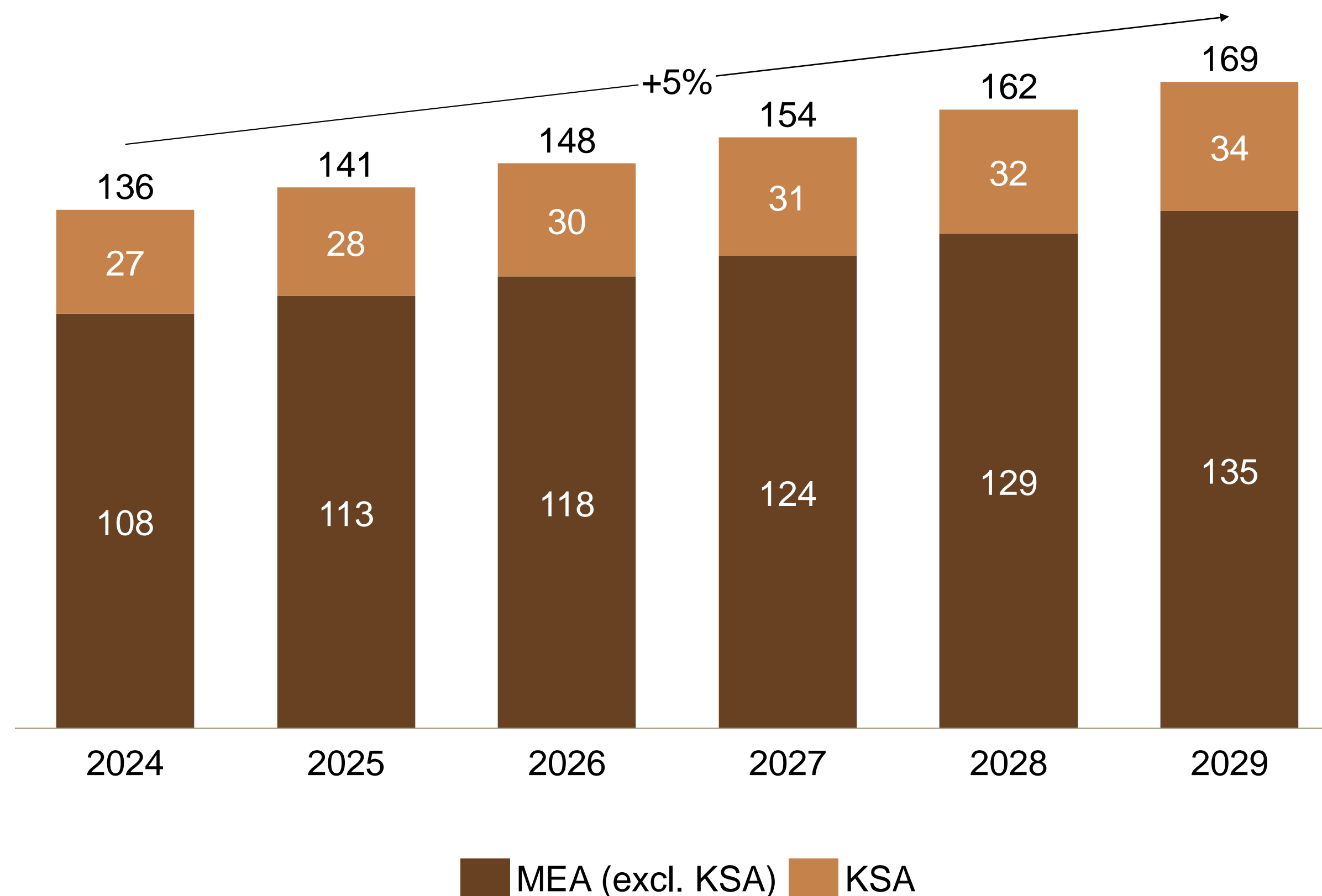
- Waste water treatment
- Industrial plants
- Refining and petrochemical industry

Catalyzing Supply Chains




1. Aramco material numbers 1000757581 2. Commercial use range, however, can vary based on concentration required
 Source: Expert interviews, Saudi Aramco analysis , Team Analysis

H2S scavenger demand, customers, and drivers

Forecasted Middle East & Africa H2S Scavenger market 2024-2029 (\$MM)



Typical customers in KSA

-  Oil & Gas players
-  Municipal wastewater treatment
-  Industrial facilities

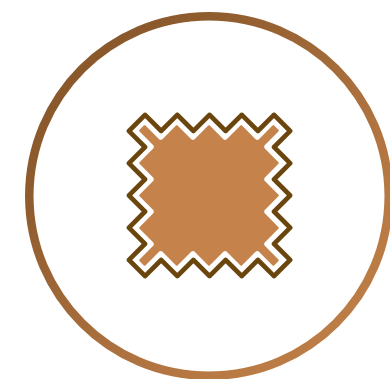
Key KSA demand drivers

- **Environment regulations:** Increasing regulatory standards within O&G industry leading to high demand for zinc free H2S scavenger as an alternative to other scavenger types in drilling
- **Sustainability trends:** KSA ambition to achieve 100% treatment of wastewater expected to drive demand for H2S scavenger which is used for odor removal

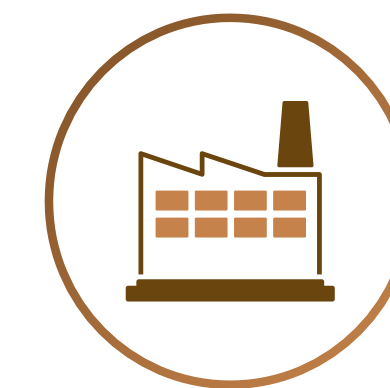
Drilling Chemicals workshop

Catalyzing Supply Chains


Value chain and key localization opportunities




Raw materials



Product formulation

Local saturation  Mixed players

Current value chain 

- Raw materials such as ammonia and ethanolamine locally available
- Opportunity to localize production of gluconic acid

Opportunity


 Few players

- Opportunity to localize production of zinc free iron gluconate based H₂S Scavenger

Opportunity

Success factors

Technology  Purification and recovery technology for gluconic acid

Labor  Biochemical engineers with expertise in ind. fermentation

• Iron gluconate synthesis and formulation technology

• Chemical engineers specialized in H₂S formulations

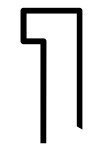
Catalyzing Supply Chains

Drilling Chemicals workshop

**Thinner / Dispersant OBM
Conditioner**

Business Opportunity

Opportunity profile



KSA in high need of thinner/dispersant Obm Conditioner to realize ongoing O&G expansion plans

Type(s)

Thinner/
 Dispersant OBM
 Conditioner

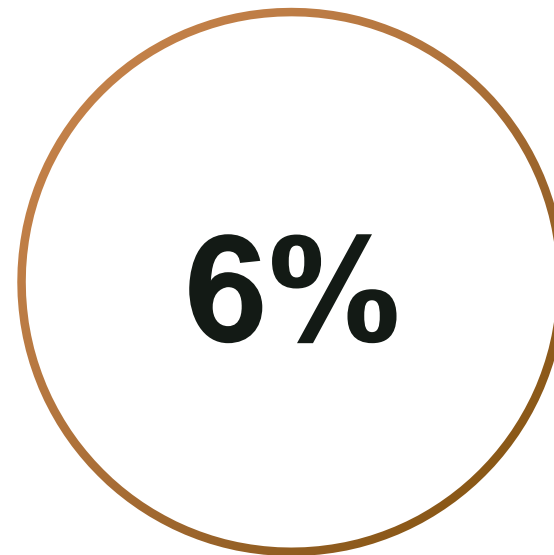
Specific gravity:
 0.9-0.96



Thinner/dispersant OBM conditioner is a niche market with moderate growth



Estimated 2024
 KSA market size

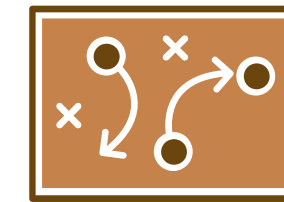


Forecasted 5-year
 CAGR

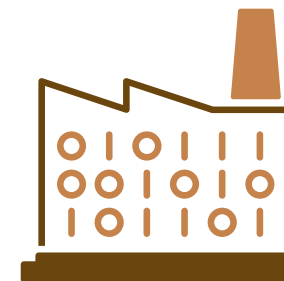


Attractive investment opportunities across the thinner/dispersant OBM value chain

KSA value chain opportunities



Intermediate process



Product formulation

Technical overview

Thinner / Dispersant OBM Conditioner¹

General specifications

- Specific gravity: 0.9 – 0.96
- Form: Dark amber liquid
- Insoluble in water

Oil & Gas applications

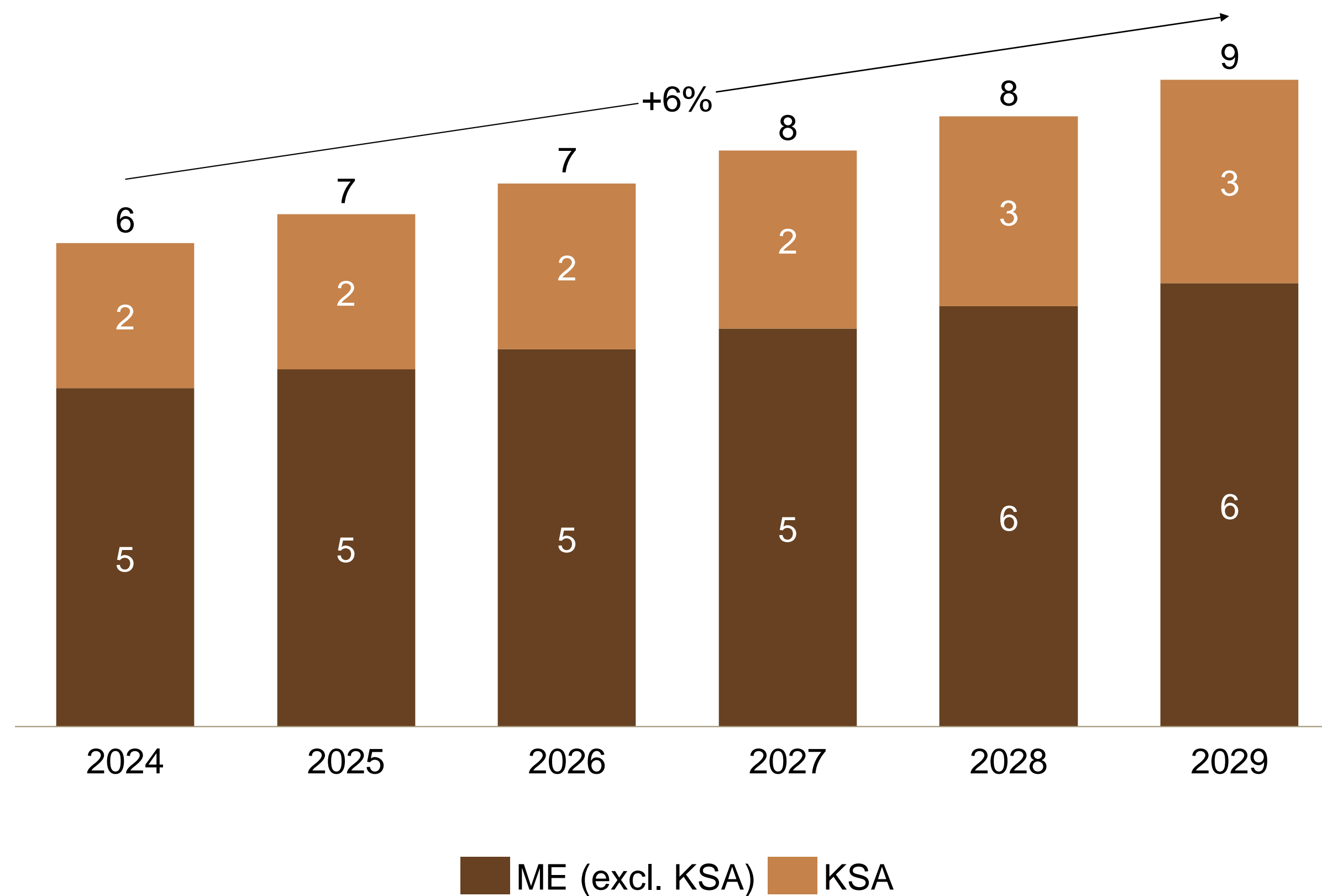
- Lower rheological properties of oil-based fluids
- Wellbore stability and filtration control
- Enhanced fluid flow and suspension

Catalyzing Supply Chains

1. Aramco material number 1000823699
Source: Expert interviews, team analysis

Thinner / dispersant OBM conditioner demand, customers, and drivers

Forecasted Middle East thinner / dispersant OBM conditioner market 2024-2029 (\$MM)



Typical customers in KSA

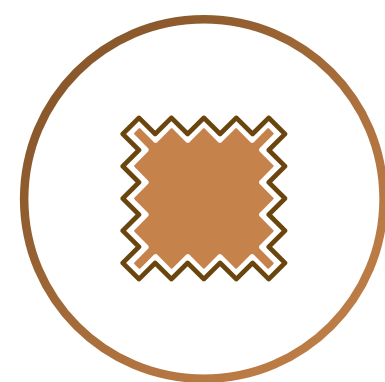
 Oil & Gas players

Key KSA demand drivers

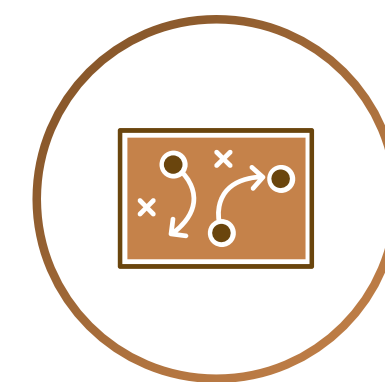
- **Consumer industry demand:** Expansion plans for oil wells lead to an increased need for thinner / dispersant OBM conditioner to improve fluid viscosity and wellbore stability
- **Rise in production capacity:** Rise in targeted daily oil production through 2027 expected to increase demand for thinner / dispersant OBM conditioner

Drilling Chemicals workshop

Value chain and key localization opportunities



Raw materials



Intermediate process



Product formulation

Local saturation



Multiple players

Current value chain

- Aromatic solvents available locally



Mixed players

- Opportunity to localize organophilic clay, alkylphenol and lignosulphonate production



Few players

- Opportunity to localize production of thinner/dispersants OBM conditioners

Opportunity

Opportunity

Success factors

Technology



- Advanced machinery and reactors for high quality blending and production

Labor



- Workforce with expertise in chemical processing

- Chemical engineers with expertise in formulation

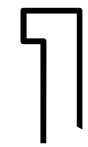
Drilling Chemicals workshop

Catalyzing Supply Chains

Ceramic Proppant

Business Opportunity

Opportunity profile



Ceramic proppant is necessary to realize unconventional O&G exploration plans

Type(s)

- High Strength Proppant
- Ultra High Strength Proppant
- Low Weight Proppant
- Resin Coated Proppant

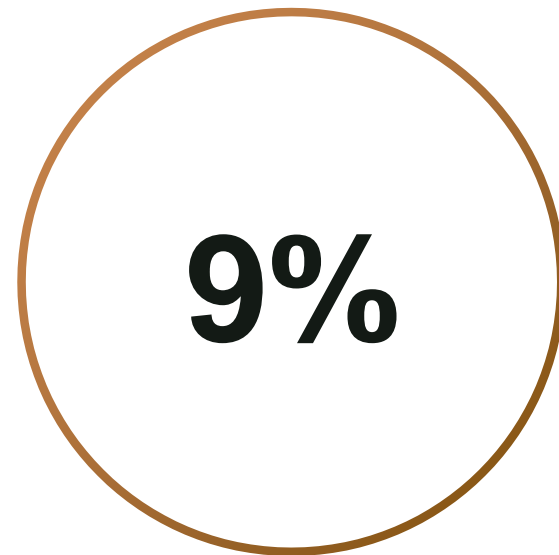
Specific gravity:
2.7 – 3.8



Ceramic proppant is a niche market with steady forecasted growth



Estimated 2024 KSA market size

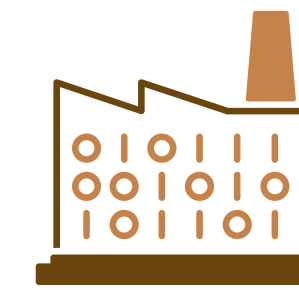


Forecasted 5-year CAGR



Attractive investment opportunities in the value chain

KSA value chain opportunities



Product formulation

Technical overview

Ceramic Proppant

General specifications

- Specific gravity: 2.7 – 3.8

- Strength: 10,000 – 14,000 psi

- Mish Size: 100, 40/70, 30/50 & 20/40

- Form: Spherical form

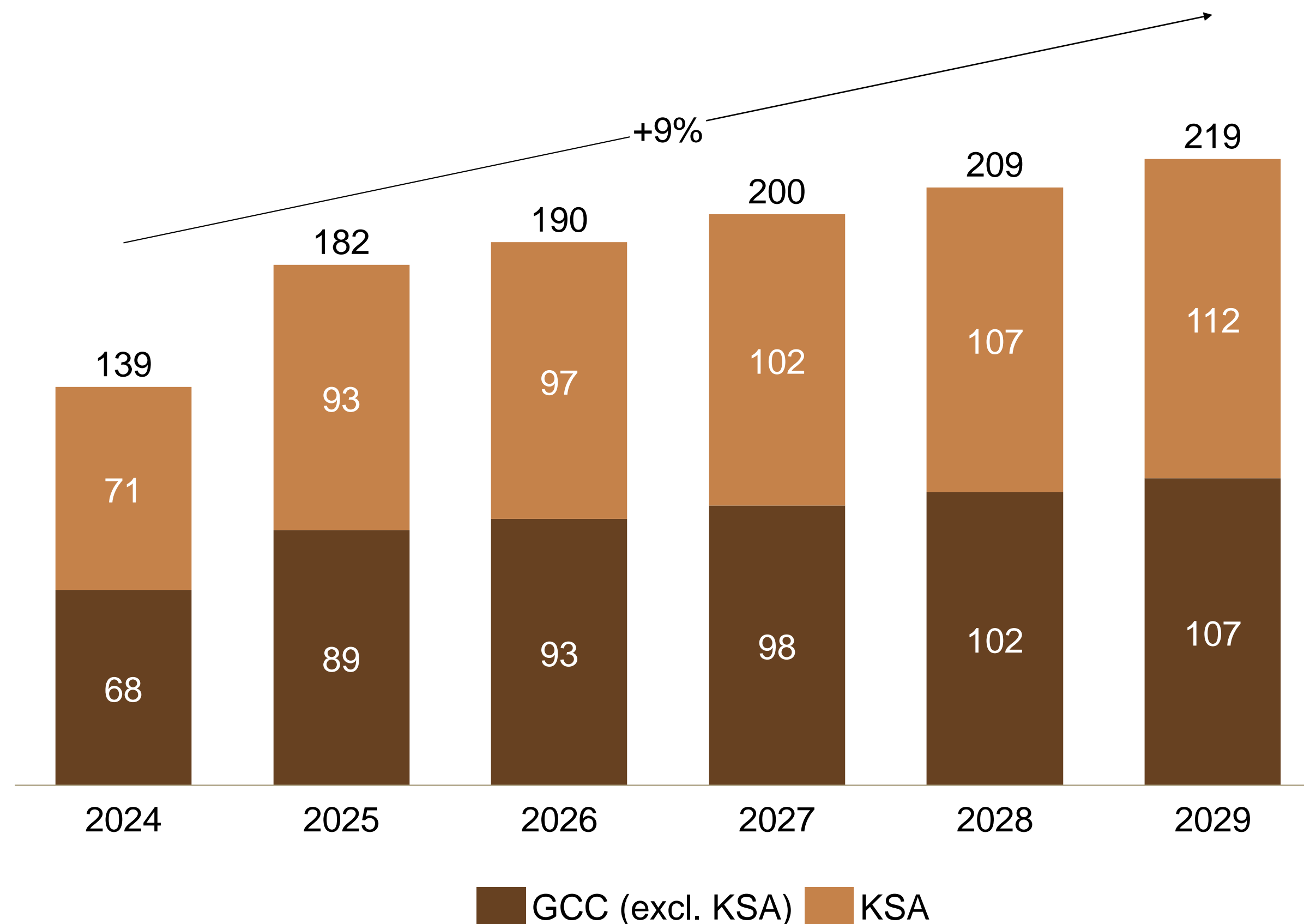
Oil & Gas applications

- Sustaining rock hydraulic fracturing
- Enhancing tight formation/rock permeability

Catalyzing Supply Chains

Ceramic proppant demand, customers, and drivers

Forecasted GCC ceramic proppant market 2024-2027 (\$ MM)



Typical customers in KSA



Oil & Gas players

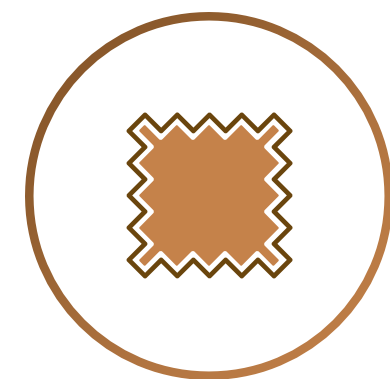
Key KSA demand drivers

- **Consumer industry growth:** Increased shale gas unconventional gas exploration leading to increased demand for ceramic proppant used for hydraulic fracturing

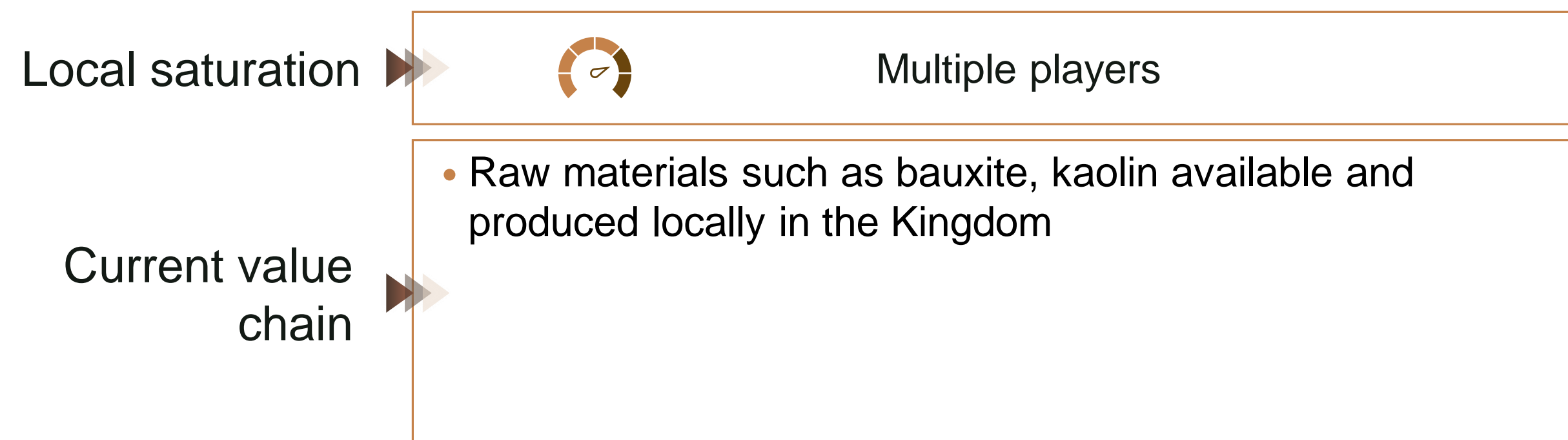
Drilling Chemicals workshop

Catalyzing Supply Chains

Value chain and key localization opportunities



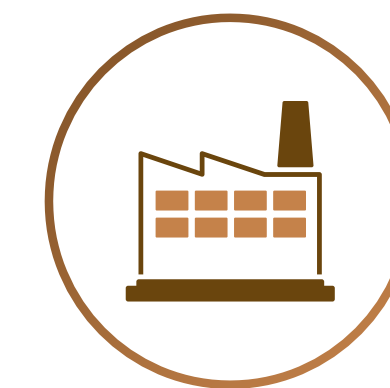
Raw materials



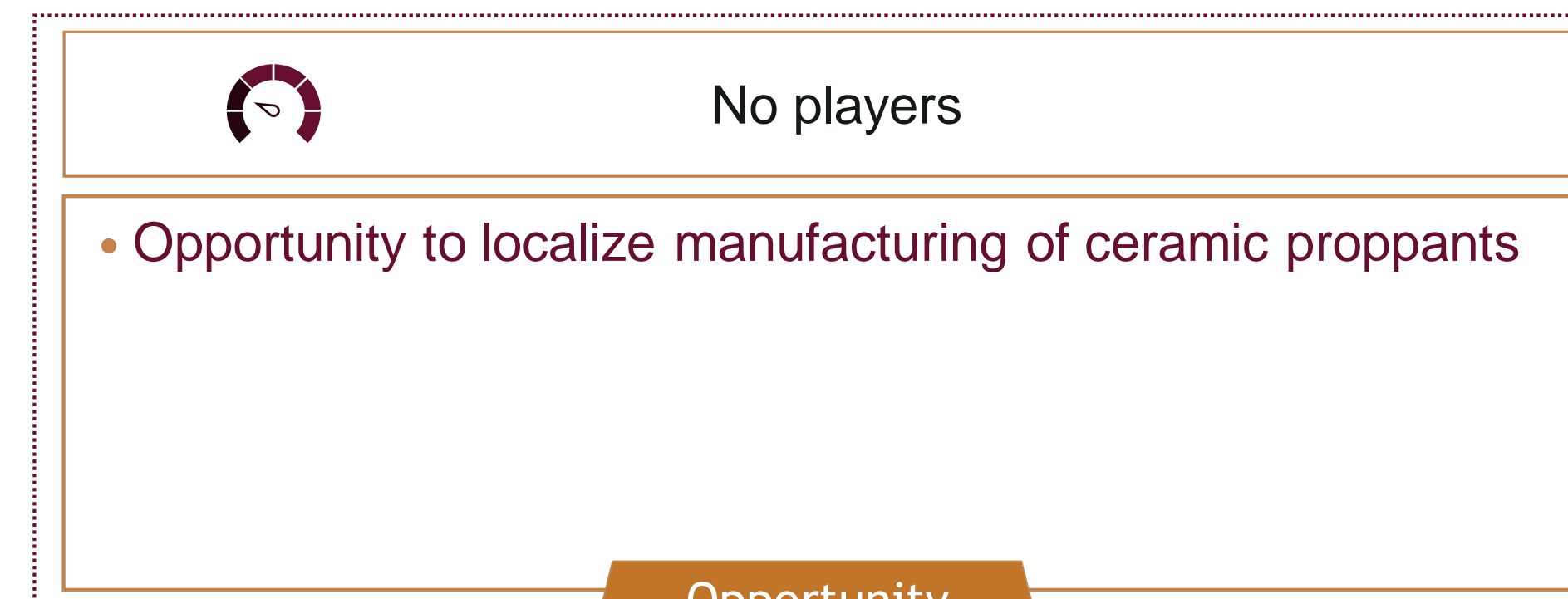
Success factors

Technology

Labor



Product formulation



Opportunity

- Precision mixing equipment such as high-shear mixers and high-performance grinders for particle size distribution

- Material scientists and process engineers with expertise in material handling, blending, and shaping

Catalyzing Supply Chains

Drilling Chemicals workshop

**Thank
You**