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Chemicals

Drilling Chemicals Workshop

Business Opportunities

14th January 2025

Drilling Chemicals workshop

Catalyzing Supply Chains

Forum & Exhibition 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

Business Opportunities

12 Sectors

210 Business Opportunities

$28 bn Annual Market Size

Anchor Projects

6 Anchor projects

IMI

SPARK

Tuwaiq

Local Workforce Development

16 National training centers

90+ Programs

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

Fire protection workshop

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iktva Program Overview (2/2)

Non-exhaustive

iktva Business Development Team Support

- Market Analysis
- Technical Engagement
- Operational Support and Advisory Services[1]

Government/Semi-government key enablers

- Financial Support
- Fiscal Incentives
- Land Solutions
- HR Development
- Regulatory Enablers

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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

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

Non-exhaustive

3 Industrial Zones and Economic Cities

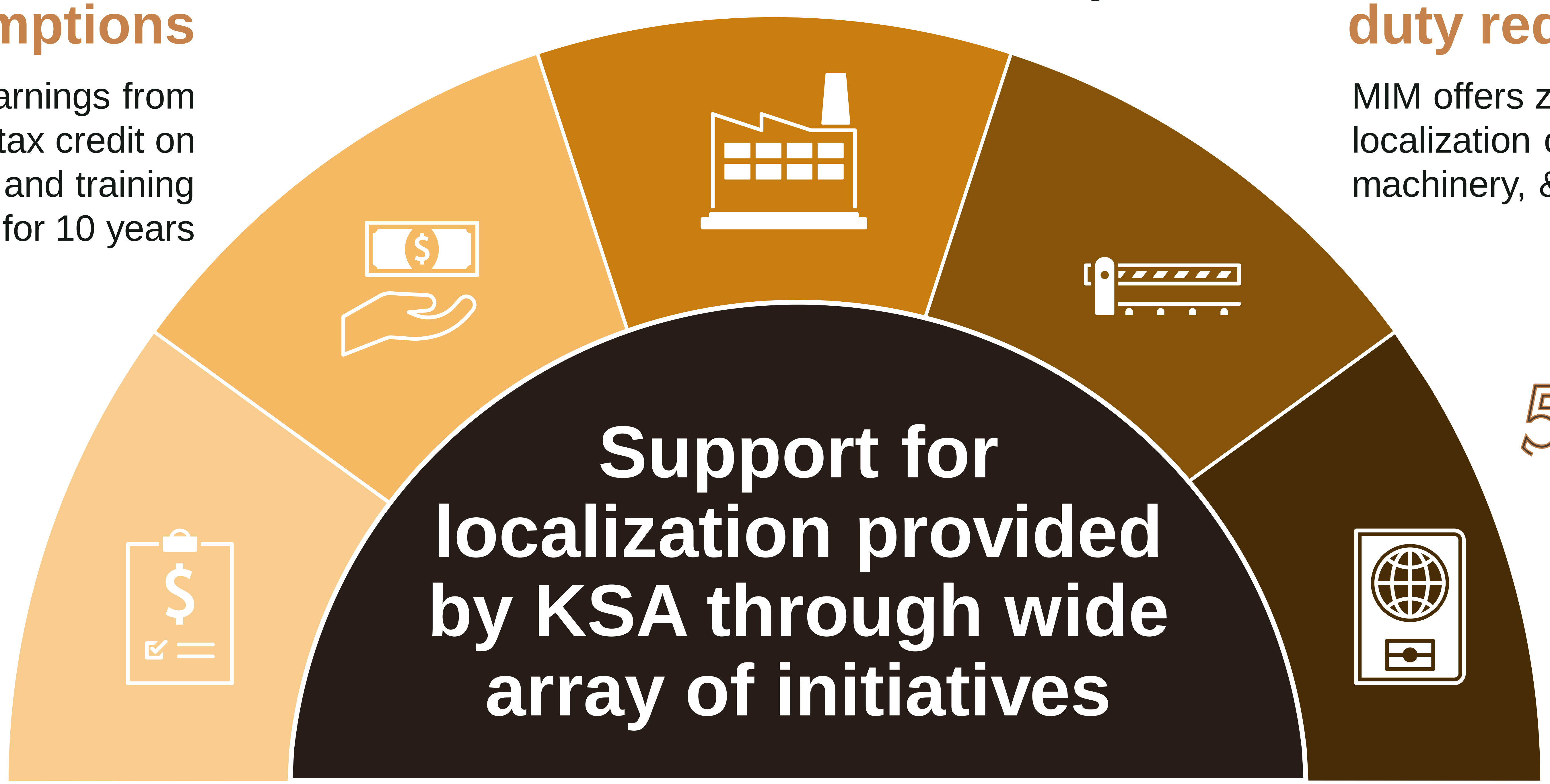
Industrial zones like Plaschem Park, SPARK and Jubail Industrial City provide specialized infrastructure and logistical services essential for chemical manufacturing

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

4 Customs and import duty reductions

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



1 Subsidies and financial programs

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

5 Visa and legal support

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

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Note: SIDF - Saudi Industrial Development Fund; MIM = Ministry of Industry and Mineral Resources; MISA = Ministry of Investment Saudi Arabia
Source: SIDF; ZATCA; SPARK, MoCI; MISA

Non-exhaustive

Four key drivers for the KSA drilling chemicals market

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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

Source: Gulf Petrochemicals and Chemicals Association, KROHNE Group, US Energy Information Administration (EIA), Saudi Press Authority, Industrial Centre, Riyad Capital, GMI Research, Argaam

How do we define what is an opportunity?

1 Growing market

High growth high spend markets

2 Limited local players & import driven

Markets with few local contributors and high import resilience

3 Technological & labor feasibility

Markets with accessible or standardized technology and available skilled labor

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Drilling Chemicals Market Overview

KSA drilling chemical market snapshot

$1.3 B

5% CAGR[1]

2024 KSA market size for opportunities in today's workshop

17 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	Organophilic lignite
10	Sodium bromide
11	Sulphonated asphalt
12	Synthetic graphite
13	Manganese tetroxide
14	High temperature fluid loss control polymer
15	H2S scavenger zinc free iron gluconate
16	Thinner / dispersant OBM conditioner
17	Ceramic Proppant

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1. 5-year forecasted KSA CAGR (2024-2029)

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

$71 MM Estimated 2024 KSA market size

5% Forecasted 5-year CAGR

3

Attractive investment opportunities within calcium chloride value chain

KSA value chain opportunities

Product formulation

Source: S&P global commodity insights, Saudi Aramco analysis, team analysis

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Technical overview

Calcium Chloride (77–78%)[1]

General specifications

- Chemical formula: $CaCl_2$
- 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

1. Aramco material number 1000022533

Source: Expert interviews, Saudi Aramco analysis, team analysis

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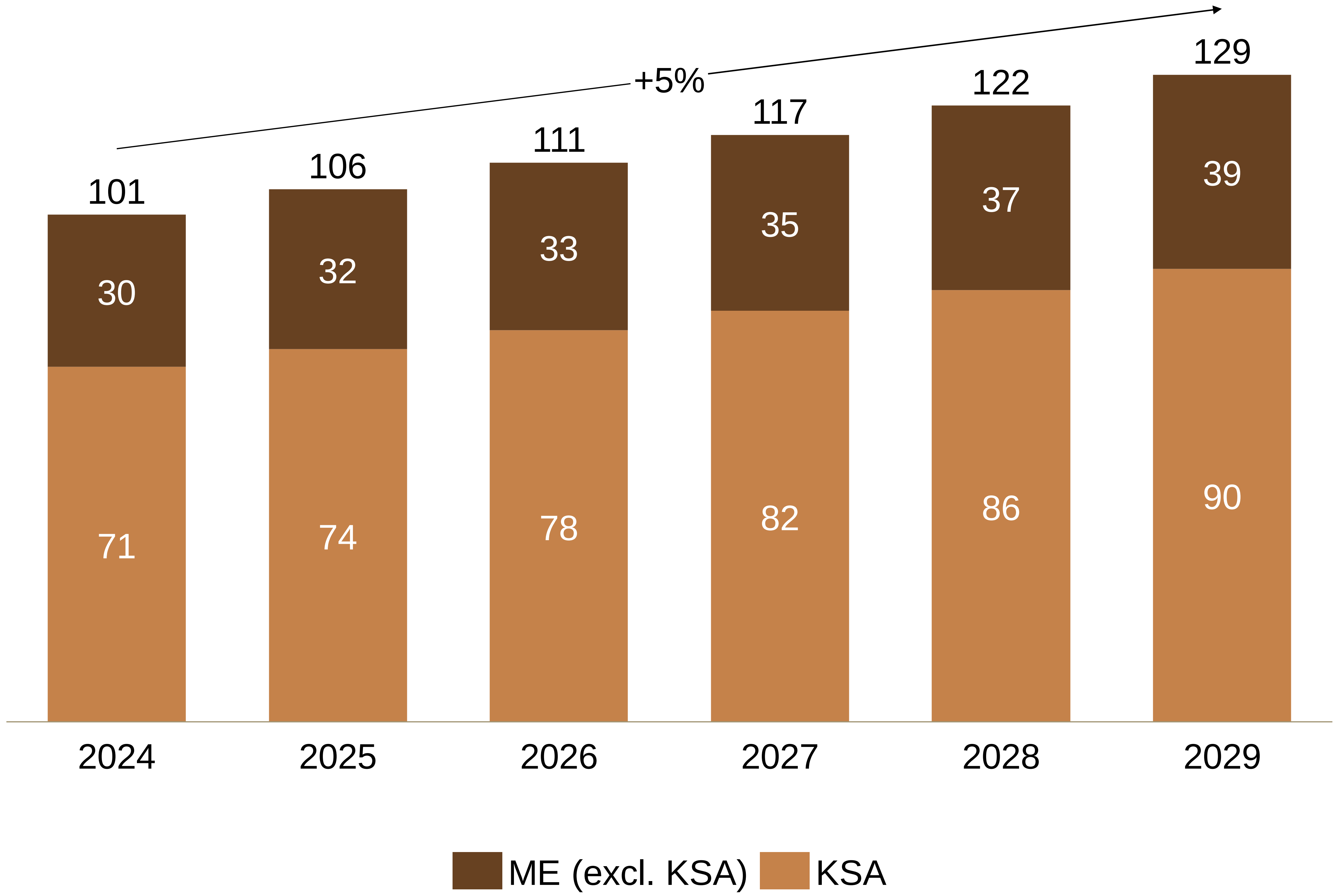
Calcium chloride demand, customers, and drivers

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



Typical customers in KSA

- Oil & Gas players
- Mining sector[1]
- 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

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1. Onsite dust control stabilization

Source: S&P global commodity insights, expert interviews, team analysis

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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			• Evaporation technology to produce calcium chloride
Labor			• Skilled chemical engineers for optimizing the chemical process

Drilling Chemicals workshop

Source: Expert interviews, team analysis

Xanthan Gum

Business Opportunity

Opportunity profile

1
Xanthan gum key for growing oil and gas and food & beverage industry

Type(s)

Xanthan gum	Specific gravity: 1.3-1.5

2
Xanthan gum is expected to show moderate growth

$52 MM — Estimated 2024 KSA market size

6% — Forecasted 5-year CAGR

3
Attractive investment opportunities in for the xanthan gum value chain

KSA value chain opportunities

Product formulation

Source: S&P global commodity insights, Saudi Aramco analysis, Team analysis

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Technical overview

Xanthan Gum[1]

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

1. Aramco material number: 1000021930

Source: Expert interviews, Saudi Aramco analysis, team analysis

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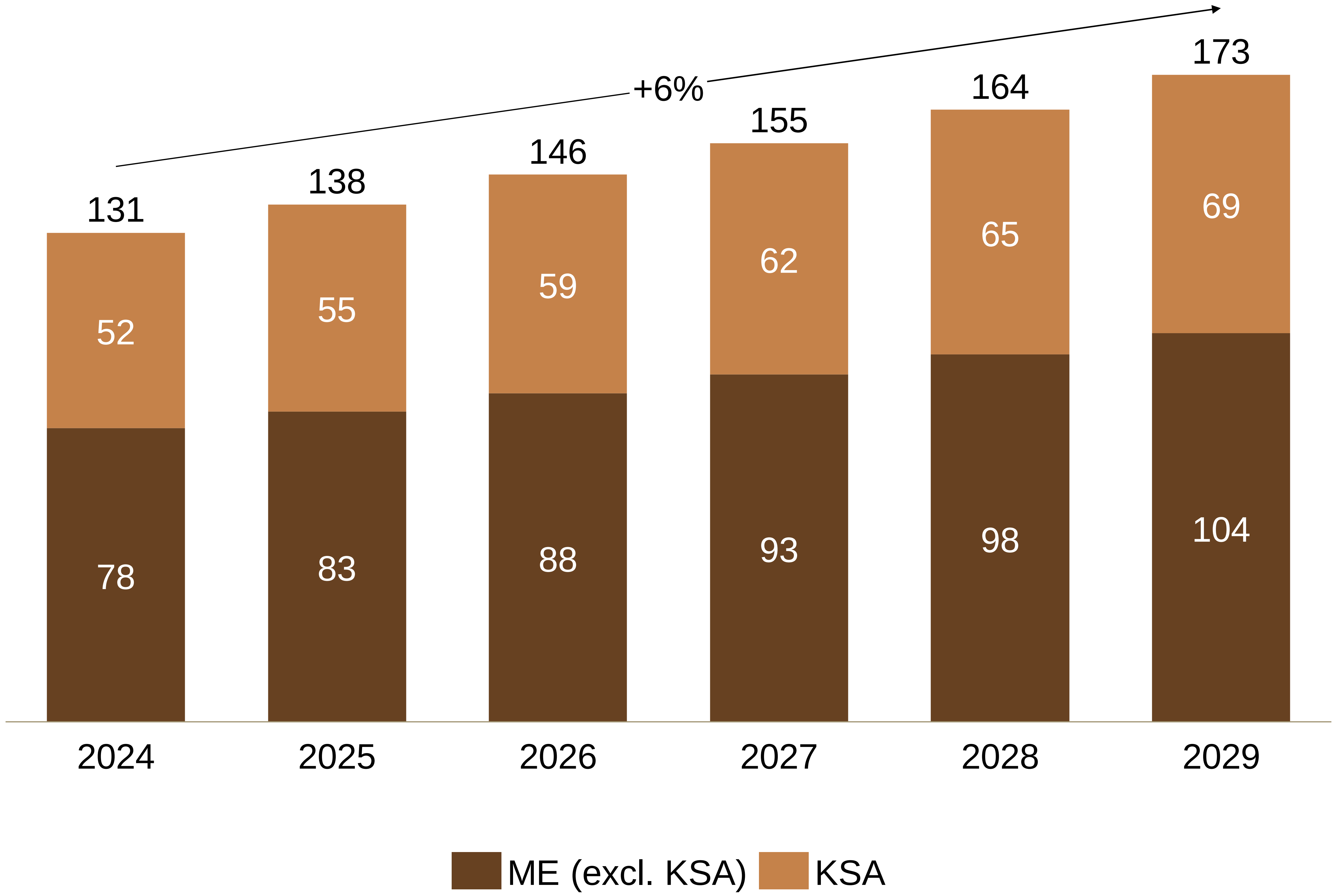
Xanthan gum demand, customers, and drivers

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

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Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	No players	Multiple players	Few players
Current value chain	• Corn and maize mostly imported as climate is not naturally conducive for large-scale cultivation	• Production of intermediary products such as corn starch, and glucose available locally	• Opportunity to localize different grades of xanthan gum production Opportunity

Success factors

Technology			• Bioreactors with oxygenation & antifoaming capabilities
Labor			• Microbiologists with expertise in controlled fermentation conditions

Drilling Chemicals workshop

Catalyzing Supply Chains

Source: Expert interviews, team analysis

Partially Hydrolyzed Polyacrylamide (PHPA)

Business Opportunity

Drilling chemicals workshop

Opportunity profile

1
PHPA is a critical component for the Kingdom's O&G expansion plans

Type(s)	
PHPA	Specific gravity: 0.75-1.4

2
PHPA market is expected to show moderate growth

$18 MM Estimated 2024 KSA market size

~5% Forecasted 5-year CAGR

3
Attractive investment opportunities exist within the PHPA value chain

KSA value chain opportunities

- Raw material
- Intermediate process
- Product formulation

Source: S&P global commodity insights, Saudi Aramco analysis, team analysis

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Technical overview

PHPA[1]

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

1. Aramco material number 1000866365

Source: Expert interviews, Saudi Aramco analysis, team analysis

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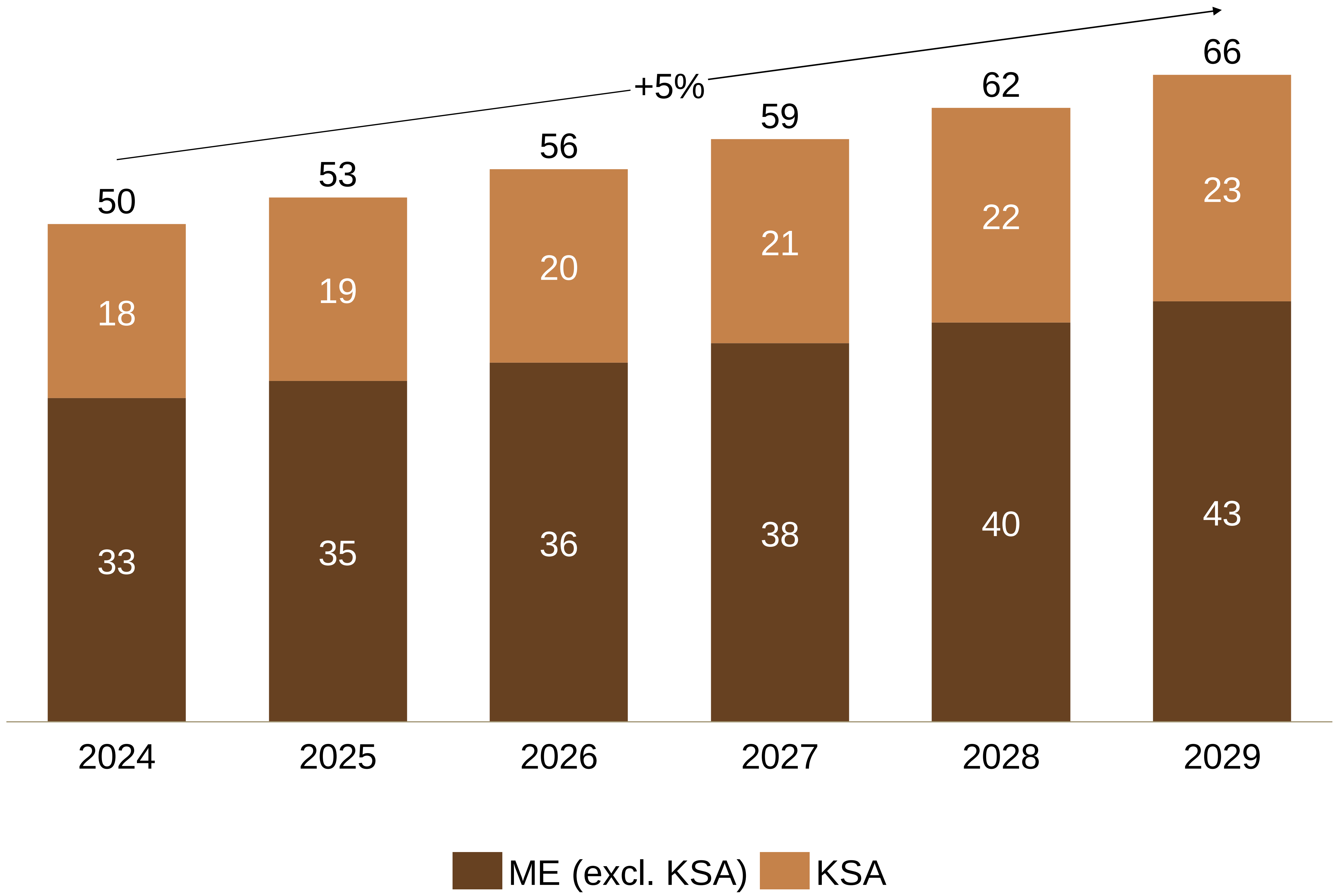
PHPA demand, customers, and drivers

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 EOR[1], 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

1. Enhanced Oil Recovery

Source: S&P global commodity insights, expert interviews, team analysis

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Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	Mixed players	Few players	Few players
Current value chain	• Sodium hydroxide available locally • Opportunity to localize acrylonitrile and ammonium persulfate Opportunity	• Opportunity to localize intermediate products such as polyacrylamide Opportunity	• Opportunity to localize production of PHPA Opportunity

Success factors

	Raw materials	Intermediate process and product formulation
Technology	• Advanced distribution control systems	• Advanced manufacturing capabilities such as mixing and reaction systems
Labor	• Skilled technicians with expertise in operating machinery	• Skilled chemical engineers for process optimization

Drilling Chemicals workshop

Catalyzing Supply Chains

Source: Expert interviews, team analysis

Sodium Carbonate (Soda Ash)

Business Opportunity

Drilling chemicals workshop

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Opportunity profile

1

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

Type(s)	
Sodium carbonate	Specific gravity: 2.53

2

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

$77 MM Estimated 2024 KSA market size

~4% Forecasted 5-year CAGR

3

Attractive investment opportunities across sodium carbonate value chain

KSA value chain opportunities

- Raw material
- Product formulation

Catalyzing Supply Chains

Source: S&P global commodity insights, Saudi Aramco analysis, team analysis

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Technical overview

Sodium Carbonate[1]

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

1. Aramco material number 1001079695

Source: Expert interviews, Saudi Aramco analysis, team analysis

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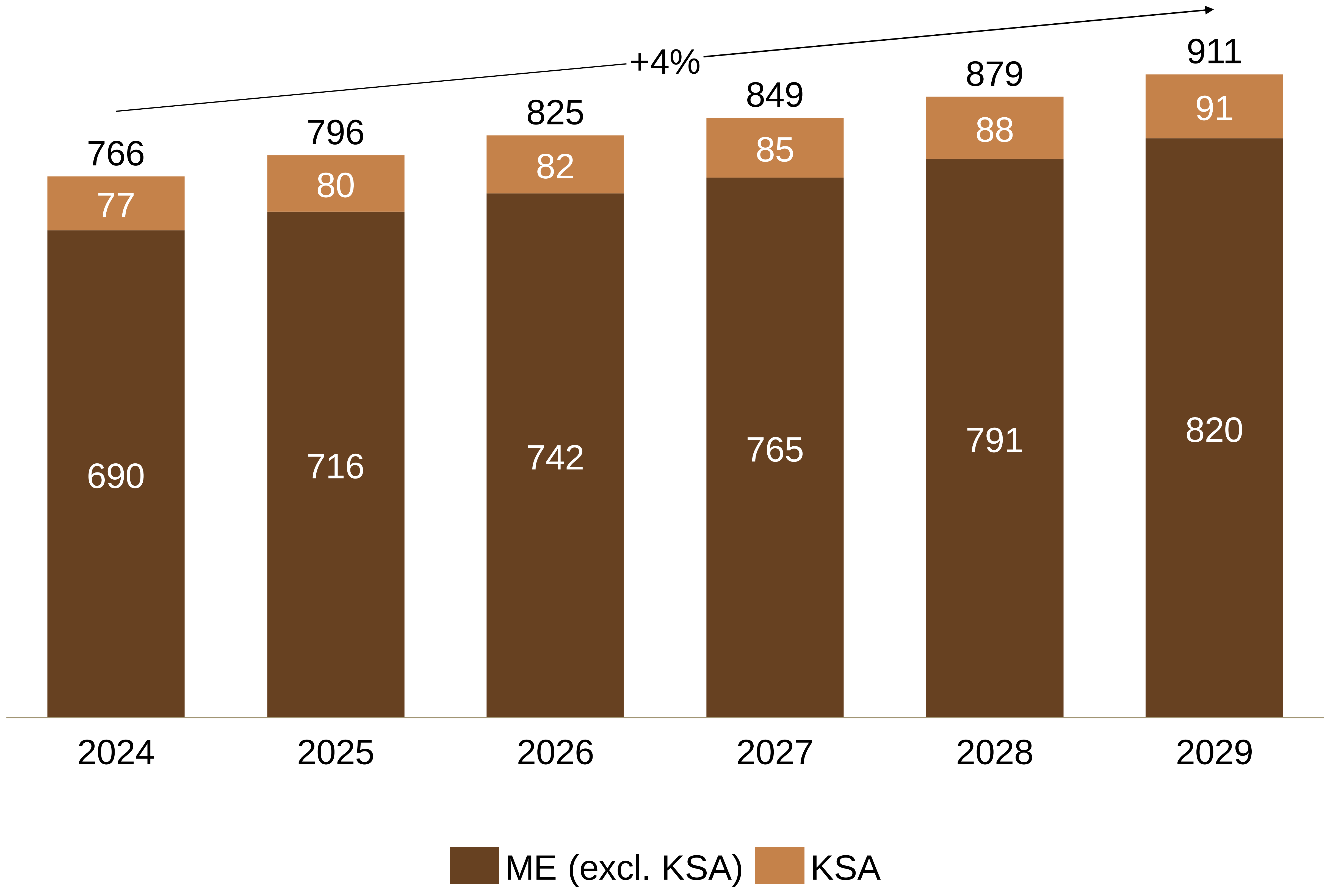
Sodium carbonate demand, customers, and drivers

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

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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

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Value chain and key localization opportunities

	Raw materials	Product formulation
Local saturation	Mixed players	Few players
Current value chain	• Production materials such as ammonia, and sodium chloride are localized • Opportunity to localize calcium carbonate production Opportunity	• Opportunity to localize sodium carbonate production Opportunity
Success factors		
Technology	• Precision grinding and particle size control technology	• Solvay process & natural trona process technology
Labor	• Engineer with expertise in process engineering and material science	• Chemical engineers with expertise in optimizing parameters to maximize output

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Source: Expert interviews, team analysis

Calcium Carbonate Flakes

Business Opportunity

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Technical overview

Calcium Carbonate: Fine Flakes[1]

General specifications

- Chemical formula: $CaCO_3$
- Specific Gravity: 2.72–2.78
- Particle size: 100 US Mesh (85–95% WT)

Calcium Carbonate: Medium Flakes[2]

General specifications

- Chemical formula: $CaCO_3$
- Specific Gravity: 2.72–2.78
- Particle size: 60 US Mesh (90% WT)

Calcium Carbonate: Coarse Flakes[3]

General specifications

- Chemical formula: $CaCO_3$
- 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

1. Aramco material number 1000813534 2. Aramco material number 1000813690 3. Aramco material number 1000813535

Source: Expert interviews, Saudi Aramco analysis, team analysis

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Value chain and key localization opportunities

	Raw materials	Product formulation
Local saturation	Multiple players	Few players
Current value chain	• Raw materials such as limestone and calcium hydroxide available locally	• Opportunity to localize calcium carbonate flakes Opportunity

Success factors

	Raw materials	Product formulation
Technology		• Precision grinding and particle size control technology
Labor		• Engineer with expertise in process engineering and material science

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Source: Expert interviews, team analysis

Synthetic lubricants

Business Opportunity

Opportunity profile

1
High need for synthetic lubricants to realize oil & gas expansion plans and growing demand in automotive sector

Type(s)

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

2
Synthetic lubricants market is sizeable with significant forecasted growth

$9 MM Estimated 2024 KSA market size

2% Forecasted 5-year CAGR

3
Attractive investment opportunities in the synthetic lubricant value chain

KSA value chain opportunities

- Raw material
- Product formulation

Drilling Chemicals workshop

Catalyzing Supply Chains

Source: S&P global commodity insights, Saudi Aramco analysis, team analysis

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 lubricants[2]

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

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

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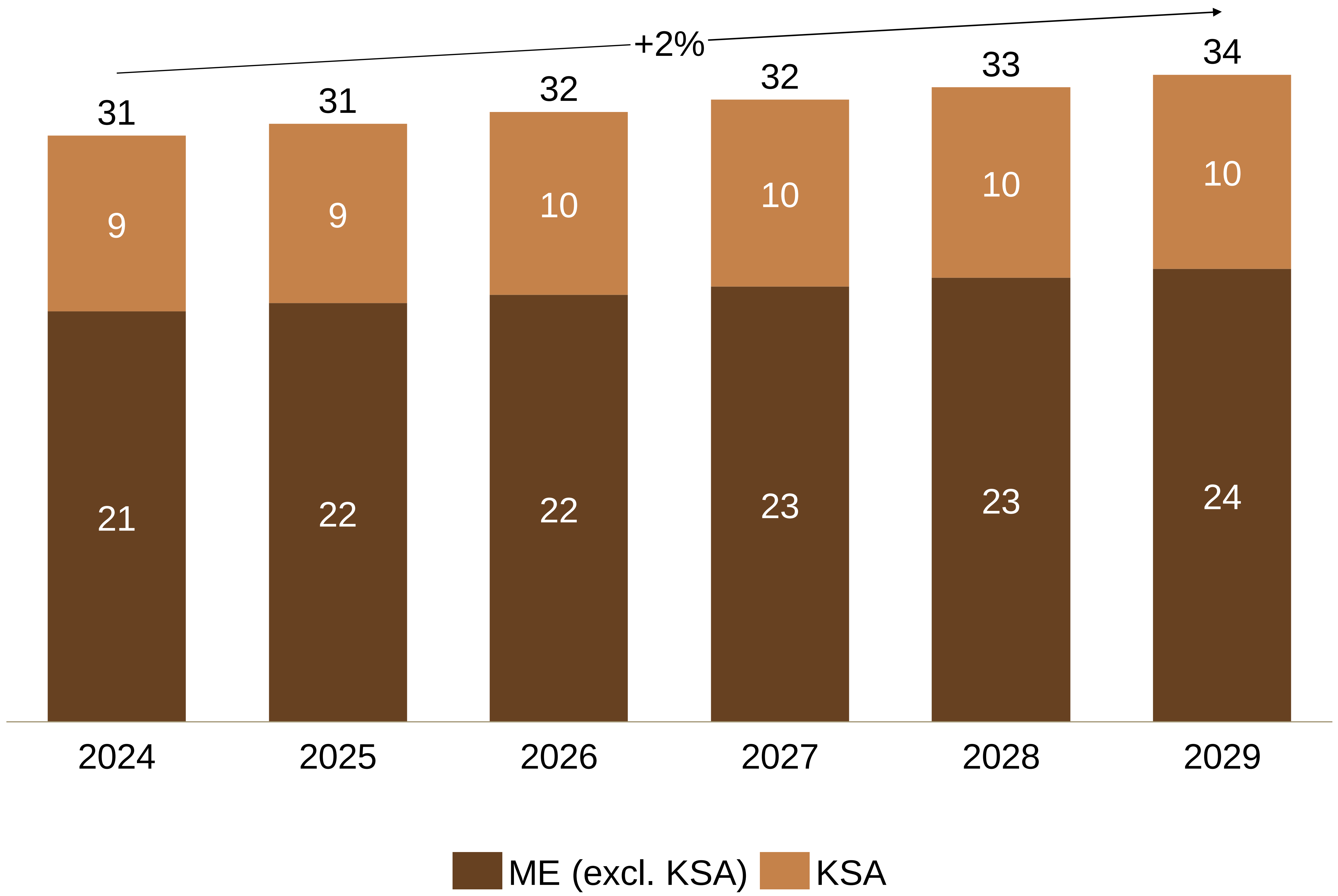
Synthetic lubricants demand, customers, and drivers

Forecasted Middle East synthetic lubricants[1] 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

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

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Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	Mixed players	Multiple player	Few players
Current value chain	• Sodium hydroxide, methanol, nitric acid sulfuric acid produced locally • Opportunity to localize fatty acid[1] Opportunity	• Polyols and pentaerythritol manufactured locally	• Opportunity to localize the production of synthetic lubricants Opportunity
Success factors			
Technology	• Process optimization technology to produce high purity fatty acids		• High precision formulation equipment & adv. testing facility
Labor	• Specialists in chemical processing		• Specialists in formulation chemistry

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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

Type(s)

Polyanionic cellulose–regular & low viscosity	Specific gravity: 1.4-1.5

2
PAC is a niche market with steady forecasted growth

$25 MM — Estimated 2024 KSA market size

3% — Forecasted 5-year CAGR

3
Attractive investment opportunities in the PAC value chain

KSA value chain opportunities

- Intermediate process
- Product formulation

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Source: S&P global commodity insights, Expert interviews, Team Analysis

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Technical overview

Polyanionic cellulose – Regular[1] & Low viscosity[2]

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

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

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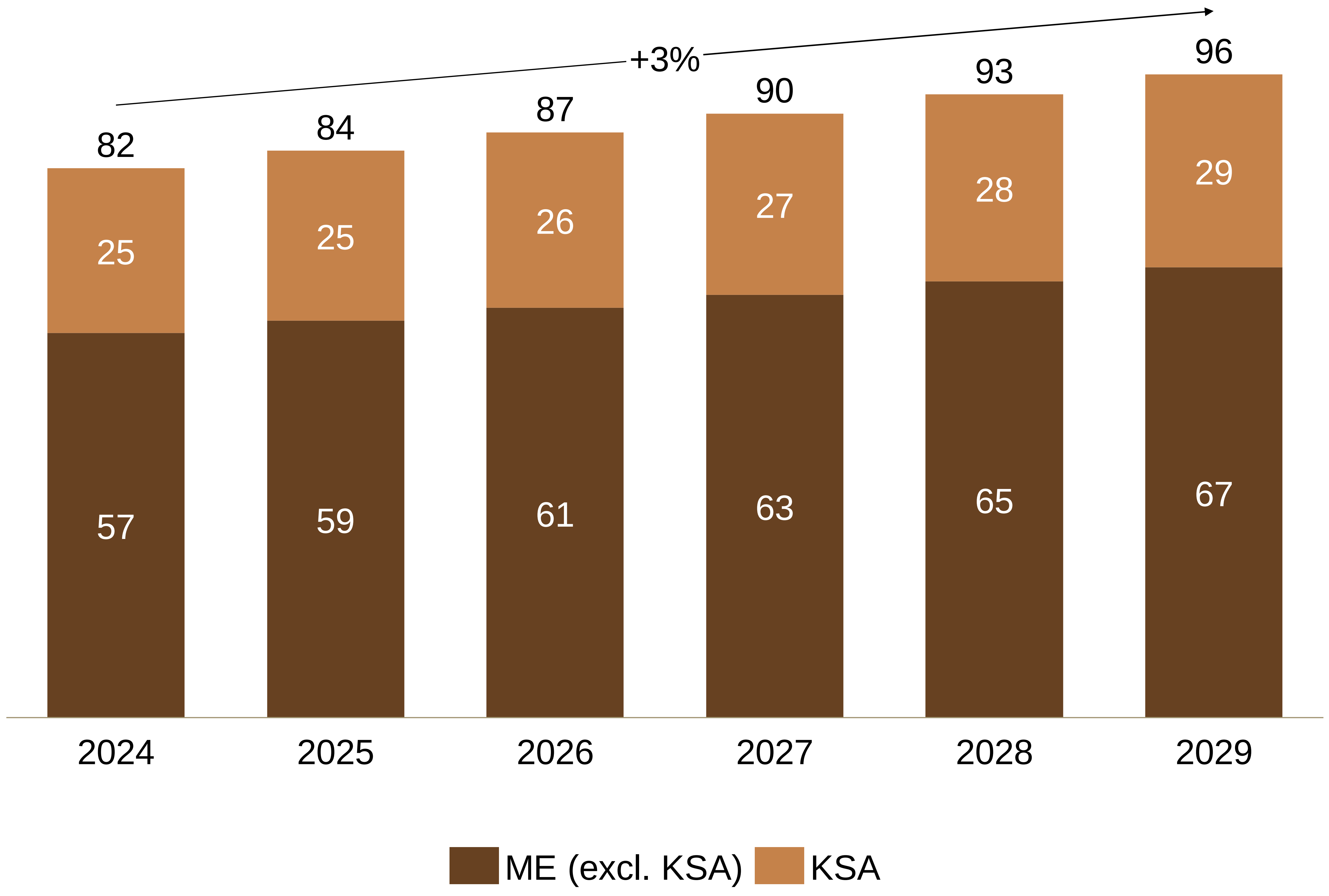
PAC demand, customers, and drivers

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

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Source: S&P global commodity insights, Expert interviews, Saudi Aramco data, Team analysis

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Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	No players	Few players	Few players
Current value chain	• Raw materials such as wood pulp and cotton not localized due to climatic conditions	• Opportunity to localize cellulose sourcing and processing Opportunity	• Opportunity to localize polyanionic cellulose Opportunity

Success factors

	Intermediate process	Product formulation
Technology	• Cellulose extraction technology	• Advanced reactors and control systems
Labor	• Biochemical engineers for enzymatic hydrolysis process	• Engineers with expertise in polymer science & control systems

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Source: Expert interviews, team analysis

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Hydroxyethyl Cellulose

Business Opportunity

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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

$48 MM — Estimated 2024 KSA market size

2% — Forecasted 5-year CAGR

3

Attractive investment opportunities in for the HEC value chain

KSA value chain opportunities

- Intermediate process
- Product formulation

Source: S&P global commodity insights, expert interviews, team analysis

Technical overview

Hydroxy Ethyl Cellulose[1]

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

1. Aramco material numbers 1000021672

Source: Expert interviews, Saudi Aramco analysis , Team Analysis

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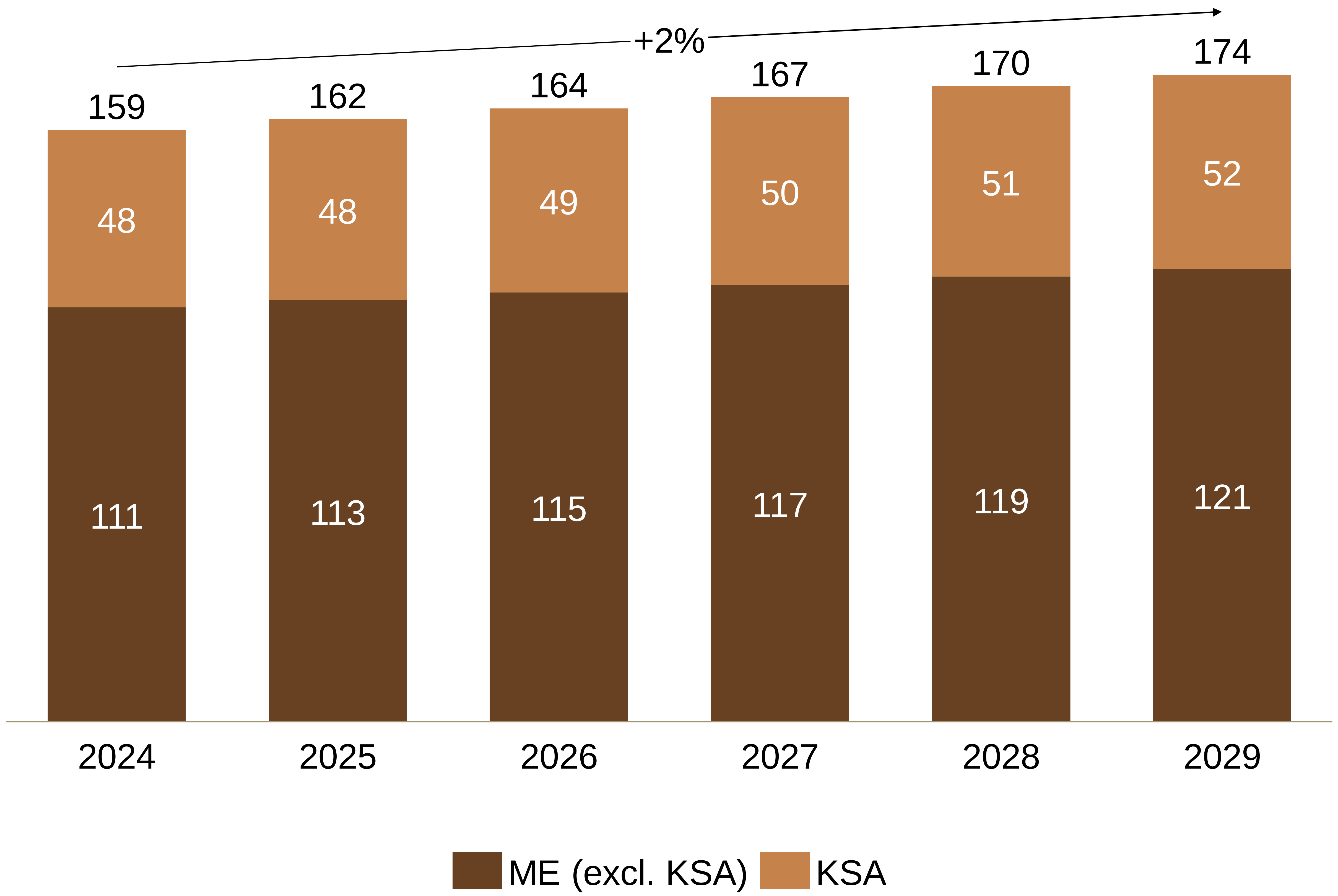
Hydroxyethyl cellulose (HEC) demand, customers, and drivers

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

Source: S&P global commodity insights, Expert interviews, Team analysis

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Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	No players	Mixed players	Few players
Current value chain	• Raw materials such as wood pulp and cotton not localized due to climatic conditions	• Ethylene oxide and sodium hydroxide manufactured locally • Opportunity to localize cellulose sourcing and processing Opportunity	• Opportunity to localize production of hydroxyethyl cellulose Opportunity

Success factors

	Raw materials	Intermediate process	Product formulation
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

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Source: Expert interviews, Team Analysis

Organophilic lignite

Business Opportunity

Opportunity profile

1

KSA in high need of organophilic lignite to meet existing O&G expansion plans

Type(s)

Organophilic Lignite	Specific gravity: 1.2–1.8

2

Organophilic lignite market is expecting moderate growth

$17 MM Estimated 2024 KSA market size

6% Forecasted 5-year CAGR

3

Attractive investment opportunities in for the organophilic lignite value chain

KSA value chain opportunities

Product formulation

Source Data Intelo, Expert interviews, Saudi Aramco analysis, Team Analysis :

iktva aramco Forum & Exhibition 2025

Technical overview

Organophilic Lignite[1]

General specifications

- Specific Gravity: 1.2 – 1.8
- Form: Grey to black powder
- Low ash content and no asphalt content

Oil & Gas applications

- Filtration control additive for oil-based drilling fluids
- Shale stabilization
- Rheology modifier in water-based drilling fluid
- Deflocculant and stabilizer for water-based flocculant

Catalyzing Supply Chains

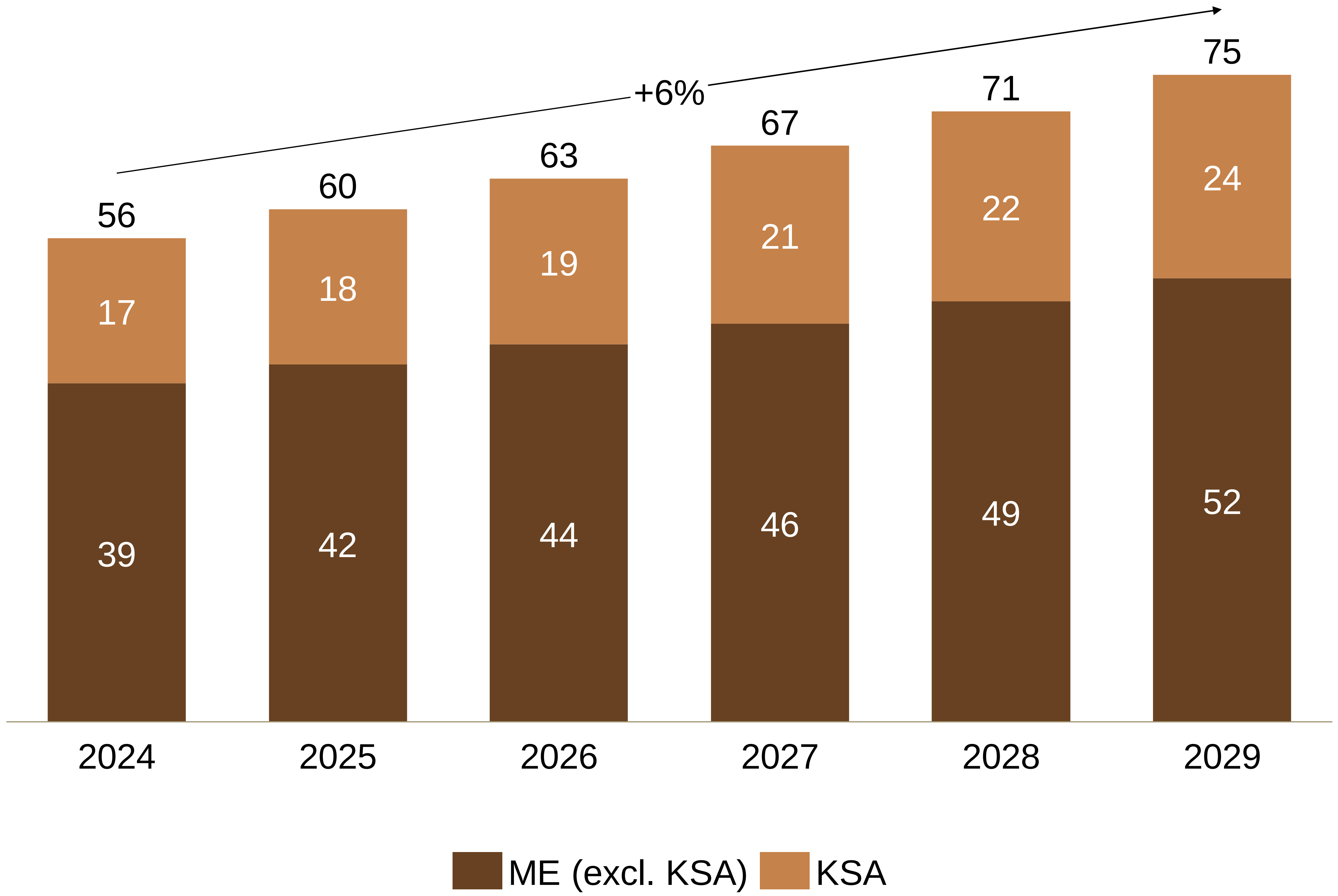
1. Aramco material number 1000022172

Source: Expert interviews, Saudi Aramco analysis, Team analysis

aramco iktva Forum & Exhibition 2025

Organophilic lignite demand, customers, and drivers

Forecasted Middle East organophilic lignite market 2024-2029 ($MM)



Typical customers in KSA

Oil & Gas players

Key KSA demand drivers

- Consumer Industry growth: Increased need for drilling fluid led by expansion plans for oil wells contribute to demand for organophilic lignite, a key filtrate additive in oil-based drilling fluids and deflocculant for water-based drilling fluids

Catalyzing Supply Chains

Source: Data Intelo, Expert interviews, Saudi Aramco analysis, Team Analysis

aramco iktva Forum & Exhibition 2025

Value chain and key localization opportunities

	Raw materials	Product formulation
Local saturation	Multiple players	Few players
Current value chain	• Raw materials such as amine compounds, sodium hydroxide, and dispersants such as isopropanol localized • Lignite imported in steady volumes due to limited reserves in the Kingdom	• Opportunity to localize production of organophilic lignite Opportunity

Success factors

	Raw materials	Product formulation
Technology		• Chemical coating/surface treatment systems
Labor		• Engineers skilled in surface chemistry & organic modification

Source: Expert interviews, team analysis

Sodium Bromide Solution

Business Opportunity

Opportunity profile

1
KSA in high need of sodium bromide to realize ongoing O&G expansion plans

Type(s)

Sodium bromide	Specific gravity: 1.46

2
Sodium bromide market is expected to see moderate growth

$12 MM — Estimated 2024 KSA market size

6% — Forecasted 5-year CAGR

3
Attractive investment opportunities in the sodium bromide value chain

KSA value chain opportunities

- Intermediate process
- Product formulation

Source: Saudi Aramco data, expert interviews, team analysis

aramco iktva Forum & Exhibition 2025

Technical overview

Sodium Bromide[1]

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 dying

1. Aramco material number 1000847075

Source: Expert interviews, Team analysis

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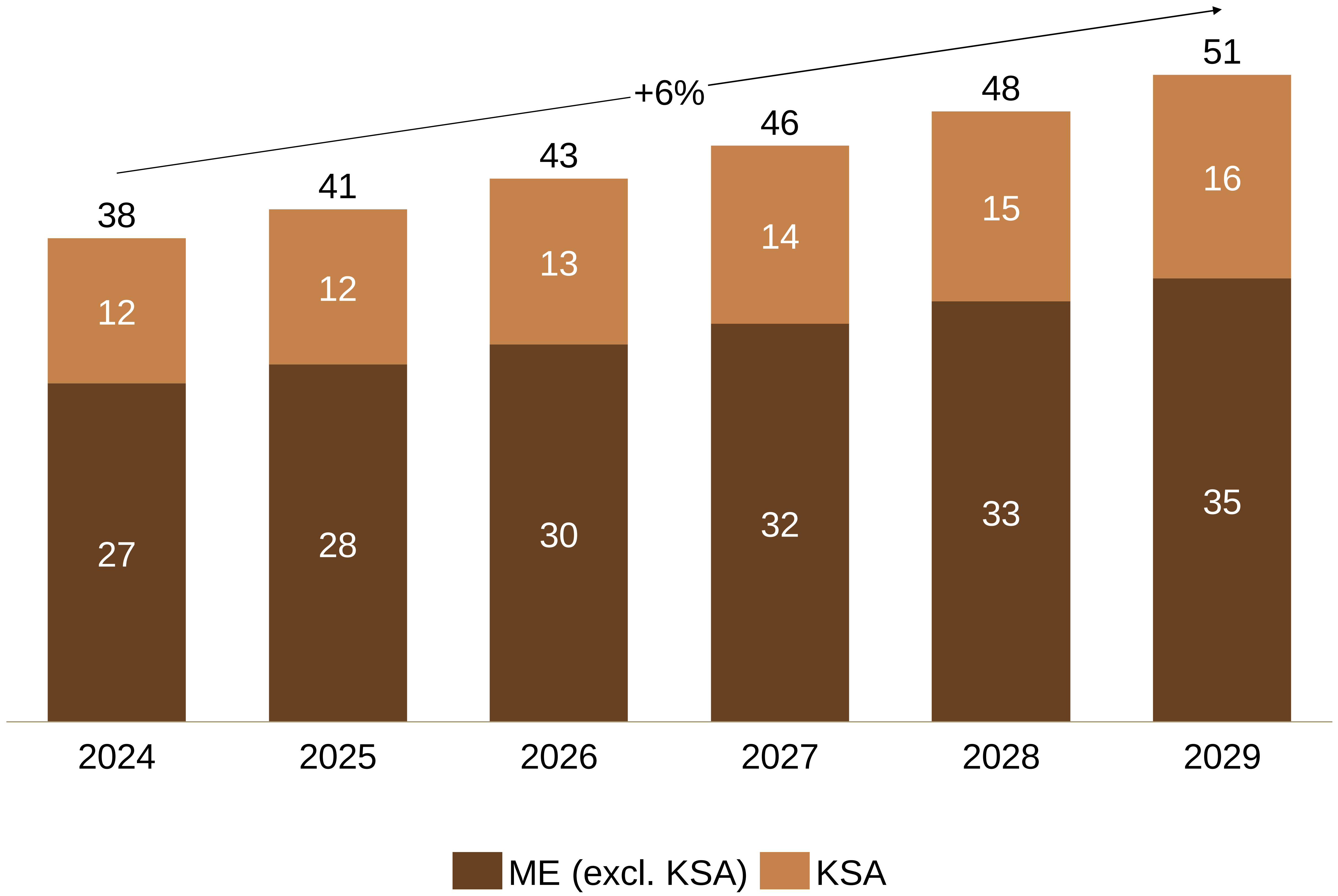
Sodium bromide demand, customers, and drivers

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

Drilling Chemicals workshop

Catalyzing Supply Chains

Source: Saudi Aramco data, expert interviews, team analysis

aramco iktva Forum & Exhibition 2025

Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	Multiple players	Mixed players	Few players
Current value chain	• Sodium chloride manufactured locally	• Sodium hydroxide available locally • Opportunity to localize hydrogen bromide (HBr) production Opportunity	• Opportunity to localize sodium bromide solution Opportunity
Success factors			
Technology		• Advanced reactor technology	• Mixing and formulation technology
Labor		• Technicians with expertise in HBr production	• Skilled workers in formulation technology

Drilling Chemicals workshop

Catalyzing Supply Chains

Source: Expert interviews, Team Analysis

Sulphonated Asphalt

Business Opportunity

Opportunity profile

1

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

Type(s)

Sulphonated Asphalt	Specific gravity: 1.1-1.3

2

Sulphonated asphalt is a niche market is with significant forecasted growth

$3 MM — Estimated 2024 KSA market size

6% — Forecasted 5-year CAGR

3

Attractive investment opportunities in the sulphonated asphalt value chain

KSA value chain opportunities

Product formulation

Source: Cognitive Market Research, Expert interviews, Team analysis

aramco iktva Forum & Exhibition 2025

Technical overview

Sulphonated Asphalt[1]

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

1. Aramco material numbers 1000021607

Source: Expert interviews, Saudi Aramco analysis , Team Analysis

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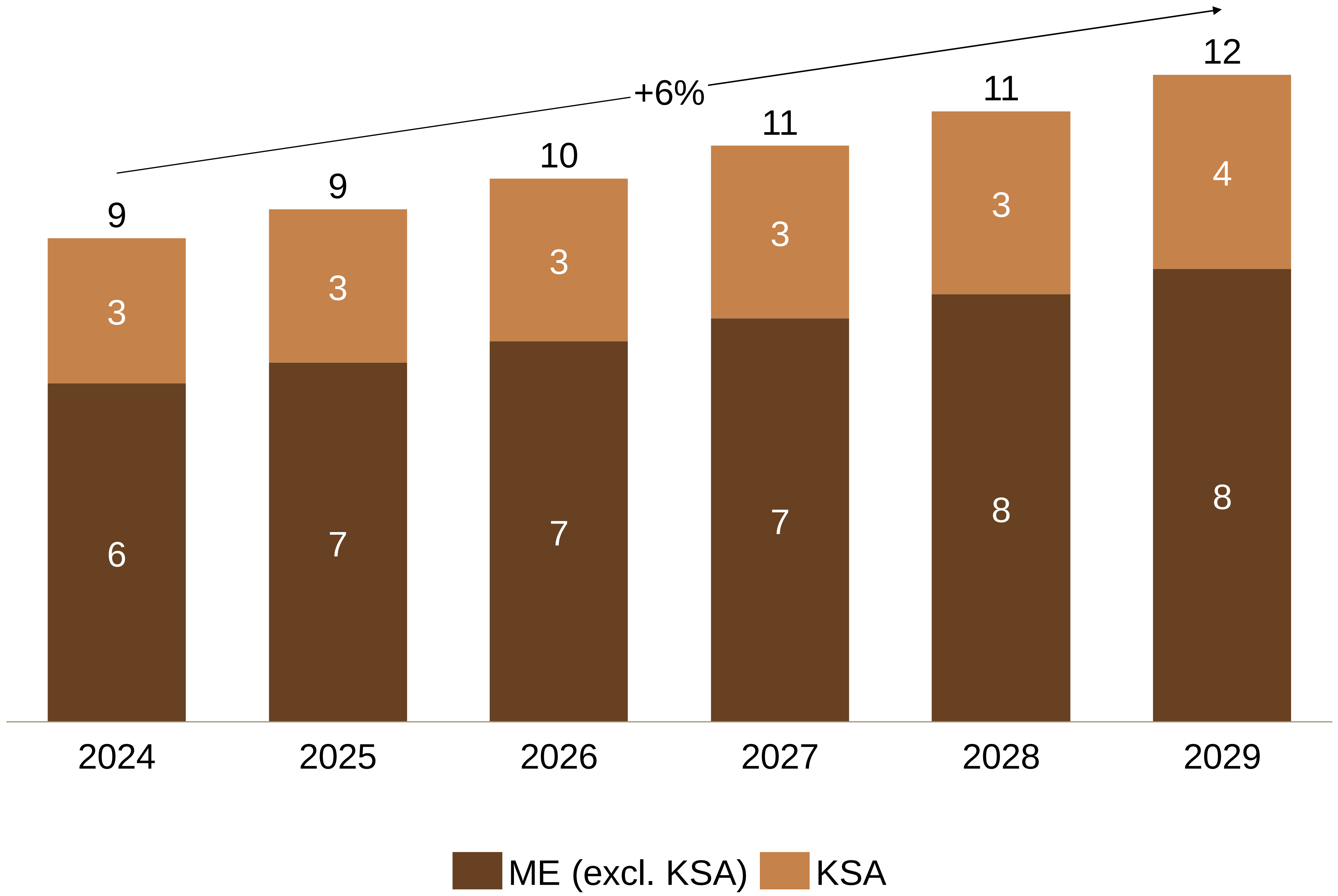
Sulphonated asphalt demand, customers, and drivers

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

Source: Cognitive Market Research, Expert interviews, team research

aramco iktva Forum & Exhibition 2025

Value chain and key localization opportunities

	Raw materials	Product formulation
Local saturation	Multiple players	Few players
Current value chain	• Raw materials such as asphalt, sulfuric acid, and other sulphur products available locally	• Opportunity to localize production of sulphonated asphalt Opportunity
Success factors		
Technology		• Advanced reaction control systems and corrosion resistant reactors
Labor		• Chemical engineers with expertise in sulphonation reactions

Drilling Chemicals workshop

Catalyzing Supply Chains

Source: Market reports, Expert interviews, Team Analysis

aramco iktva Forum & Exhibition 2025

Synthetic Graphite

Business Opportunity

Drilling chemicals workshop

Catalyzing Supply Chains

Opportunity profile

1

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

Type(s)

Synthetic graphite	Specific gravity: 1.5-1.8

2

Synthetic graphite market is expected to show moderate growth

$55 MM Estimated 2024 KSA market size

7% Forecasted 5-year CAGR

3

Attractive investment opportunities in for the synthetic graphite value chain

KSA value chain opportunities

- Raw material
- Intermediate process
- Product formulation

Catalyzing Supply Chains

Source: Mordor Intelligence, expert interviews, team analysis

aramco iktva Forum & Exhibition 2025

Technical overview

Synthetic graphite[1]

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

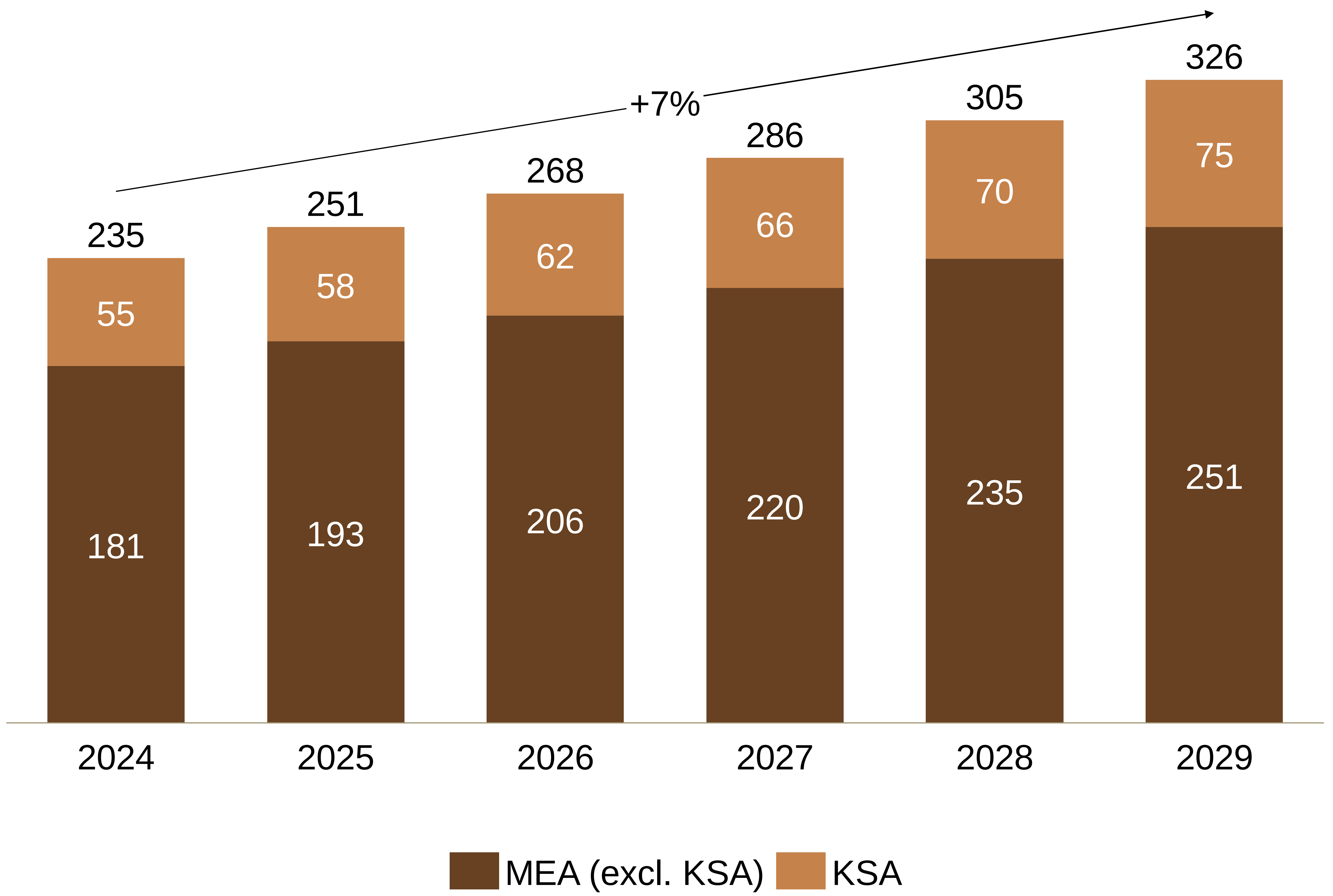
1. Aramco material numbers 1001077679

Source: Expert interviews, Team Analysis

aramco iktva Forum & Exhibition 2025

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

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Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	Few players	Few players	Few players
Current value chain	• Opportunity to localize production of high-grade low sulfur petroleum coke Opportunity	• Opportunity to localize production of calcinating needle coke and baked carbon Opportunity	• Opportunity to localize synthetic graphite Opportunity
Success factors			
Technology	• Advanced infrastructure & machinery for sulphur refining	• Controlled carbonization technology	• Technology for graphitization process
Labor	• Skilled engineers with expertise in coke refining & treatment	• Chemical engineers with expertise in graphite production	

Catalyzing Supply Chains

Drilling Chemicals workshop

Source: Expert interviews, team analysis

Manganese Tetroxide

Business Opportunity

Opportunity profile

1

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

Type(s)

Manganese tetroxide	Specific gravity: 4.8

2

Manganese tetroxide market is expected to grow moderately

$31 MM Estimated 2024 KSA market size

6% Forecasted 5-year CAGR

3

Attractive investment opportunities in for the manganese tetroxide value chain

KSA value chain opportunities

- Raw material
- Intermediate process
- Product formulation

Source: Expert interviews, Saudi Aramco data, team analysis

aramco iktva Forum & Exhibition 2025

Technical overview

Manganese tetroxide[1]

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

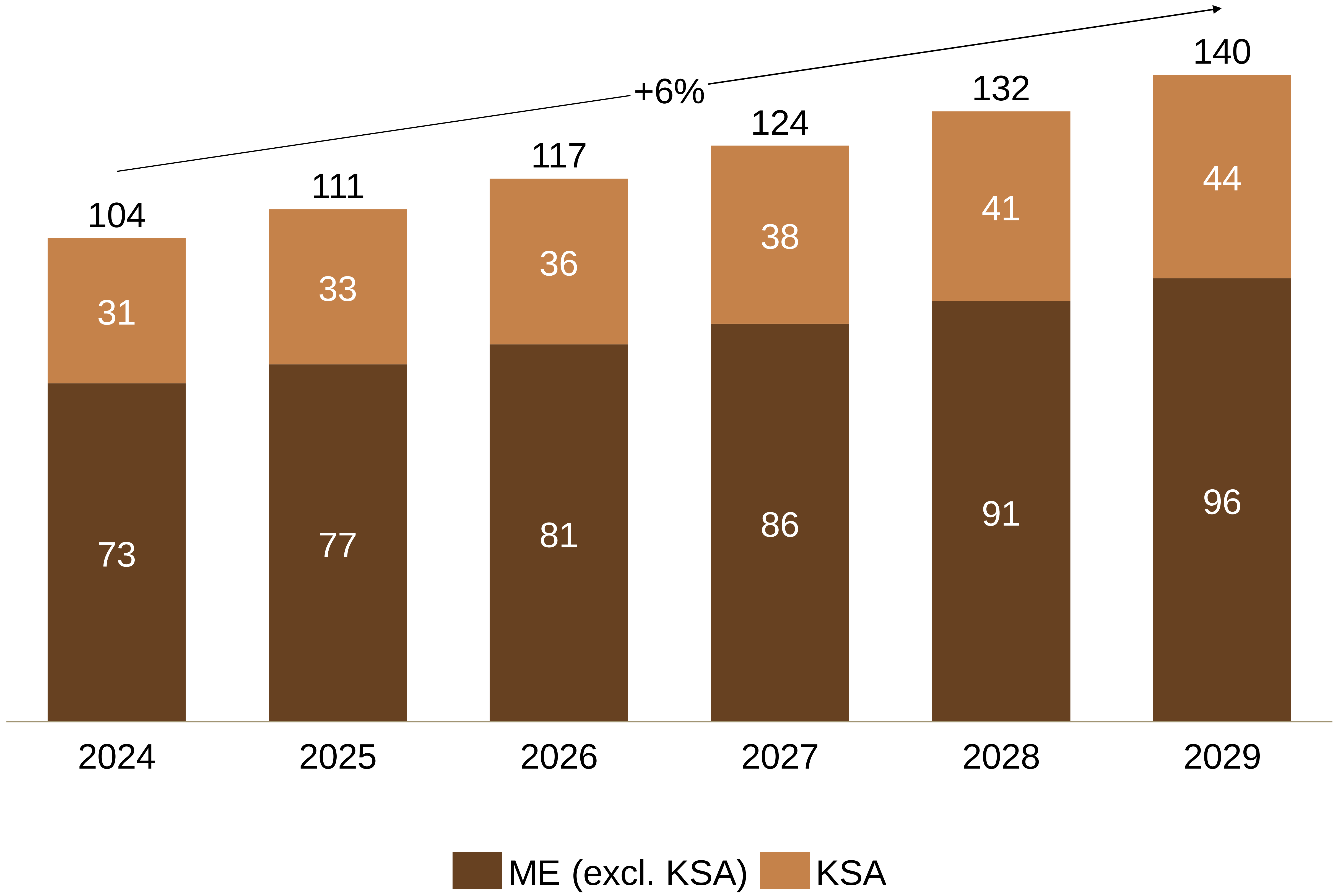
- Lithium battery for EV[2]
- Removes oxygen and sulphur in steel production

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

aramco iktva Forum & Exhibition 2025

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

Source: Expert interviews, Saudi Aramco data, team analysis

aramco iktva Forum & Exhibition 2025

Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	Mixed players	Mixed players	No players
Current value chain	• Ammonia, sodium chloride, and sulphur available locally • Opportunity localize plant for manganese production Opportunity	• Sodium hydroxide, ammonium hydroxide, and sulfuric acid locally available • Opportunity to localize manganese sulphate production Opportunity	• Opportunity to localize production of manganese tetroxide Opportunity
Success factors			
Technology	• Manganese ore processing technology & MFE plant	• Reaction control, purification, and filtration systems	• High temperature oxidation furnaces
Labor	• Mining and metallurgical engineers	• Engineers with expertise in sulphate production	• Specialists in material science

Catalyzing Supply Chains

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

High temperature fluid loss control polymer

Business Opportunity

Opportunity profile

1

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

Type(s)

High temperature fluid loss control polymer	Specific gravity: 1.1-1.3

2

HTFLCP market is niche with moderate growth expected

$3 MM — Estimated 2024 KSA market size

6% — Forecasted 5-year CAGR

3

Attractive investment opportunities in the value chain

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

aramco iktva Forum & Exhibition 2025

Technical overview

High temperature fluid loss control polymer[1]

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

1. Aramco material numbers 1000021602

Source: Expert interviews, team analysis

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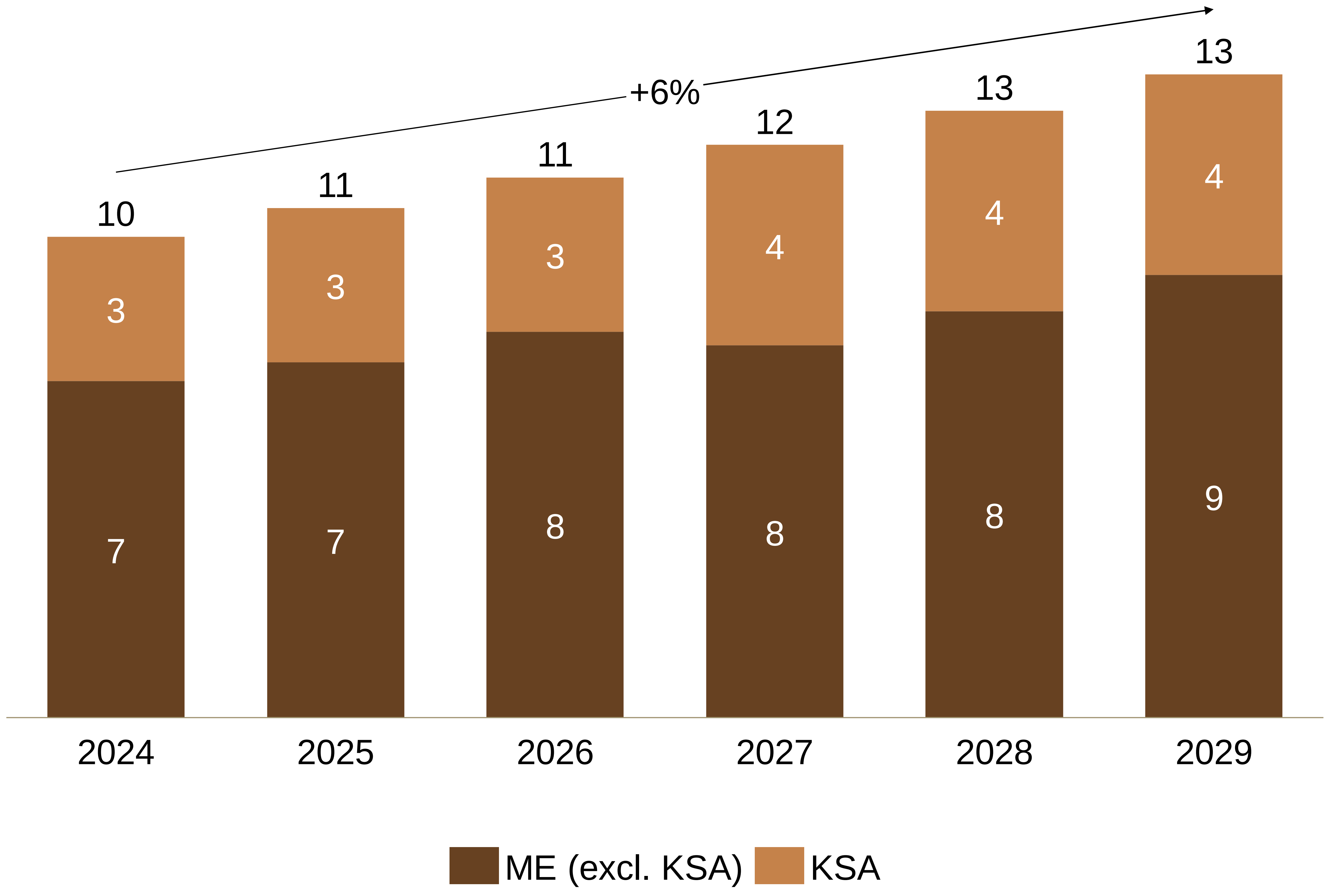
High temperature fluid loss control polymer demand, customers, and drivers

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

Source: Expert interviews, Saudi Aramco data, team analysis

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Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	Mixed players	Few players	No players
Current value chain	• Opportunity to localize acrylonitrile Opportunity	• Opportunity to localize intermediate products such as acrylamide polymers Opportunity	• Opportunity to localize high temperature fluid loss control polymer Opportunity
Success factors			
Technology	• Advanced distribution control systems	• Advanced production equipment and controlled reactors	• Thermal stability testing & precision blending equipment
Labor	• Skilled technicians with expertise in operating machinery	• Polymer and engineers and process optimization specialists	• Formulation chemists with drilling fluid expertise

Drilling Chemicals workshop

Source: Expert interviews, team analysis

H2S Scavenger zinc free iron gluconate

Business Opportunity

Opportunity profile

1

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

Type(s)

H2S scavenger zinc free iron gluconate	Specific gravity: 1.2-1.3

2

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

$27 MM Estimated 2024 KSA market size

5% Forecasted 5-year CAGR

3

Attractive investment opportunities in the H2S scavenger value chain

KSA value chain opportunities

- Raw material
- Product formulation

Source: Expert interviews, Technavio market report, team analysis

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Technical overview

Zinc free iron gluconate H_2S Scavenger[1]

General specifications

- Specific Gravity[2]: 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

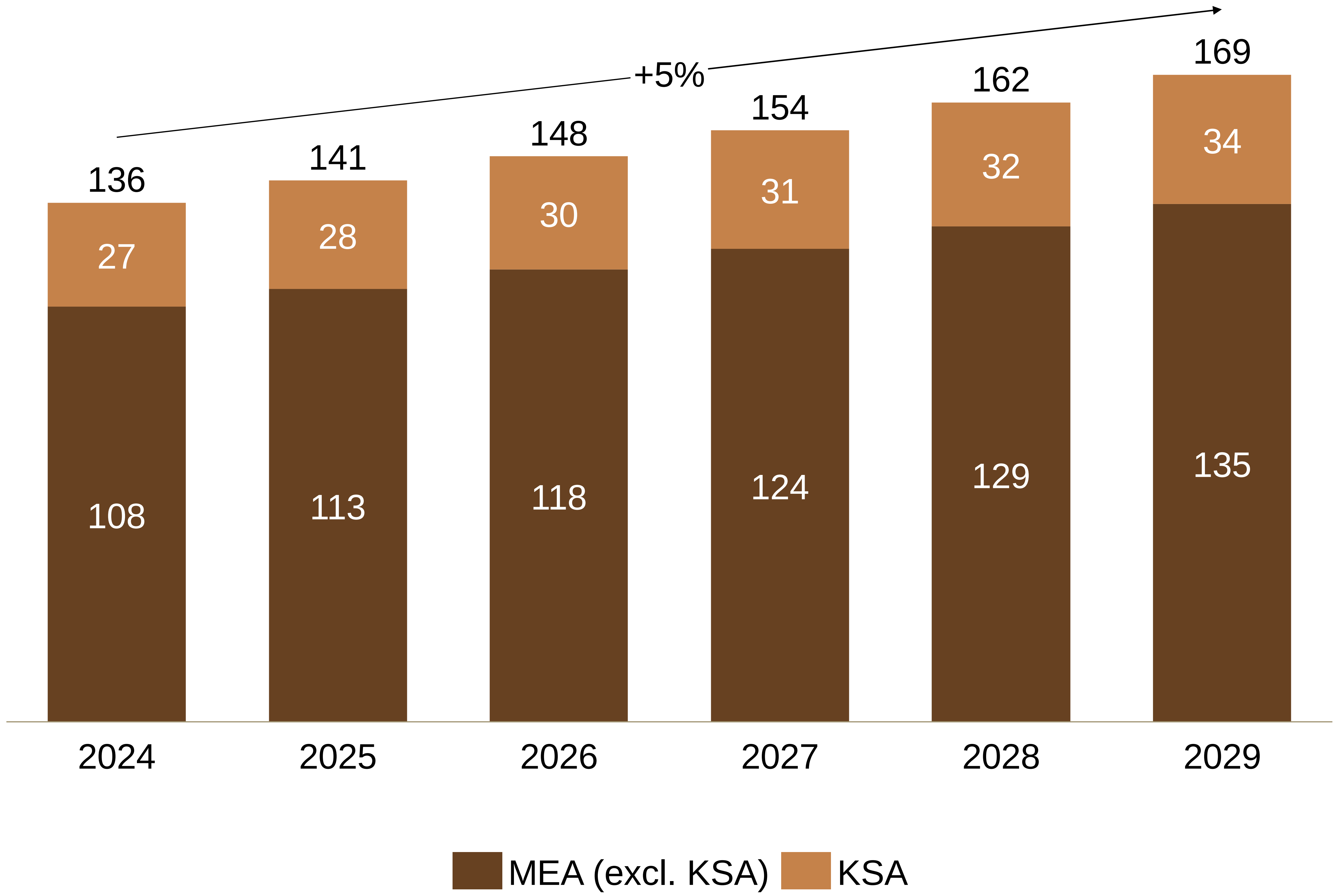
- Waste water treatment
- Industrial plants
- Refining and petrochemical industry

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

Source: Technavio market report, expert interviews, team analysis

aramco iktva Forum & Exhibition 2025

Value chain and key localization opportunities

	Raw materials	Product formulation
Local saturation	Mixed players	Few players
Current value chain	• Raw materials such as ammonia and ethanolamine locally available • Opportunity to localize production of gluconic acid Opportunity	• Opportunity to localize production of zinc free iron gluconate based H2S Scavenger Opportunity

Success factors

	Raw materials	Product formulation
Technology	• Purification and recovery technology for gluconic acid	• Iron gluconate synthesis and formulation technology
Labor	• Biochemical engineers with expertise in ind. fermentation	• Chemical engineers specialized in H_2S formulations

Drilling Chemicals workshop

Catalyzing Supply Chains

Source: Market reports, Expert interviews, Team Analysis

Thinner / Dispersant OBM Conditioner

Business Opportunity

Opportunity profile

1

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

2

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

$2 MM — Estimated 2024 KSA market size

6% — Forecasted 5-year CAGR

3

Attractive investment opportunities across the thinner/dispersant OBM value chain

KSA value chain opportunities

- Intermediate process
- Product formulation

Catalyzing Supply Chains

Source: Expert interviews, Saudi Aramco data, team analysis

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Technical overview

Thinner / Dispersant OBM Conditioner[1]

General specifications

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

Oil & Gas applications

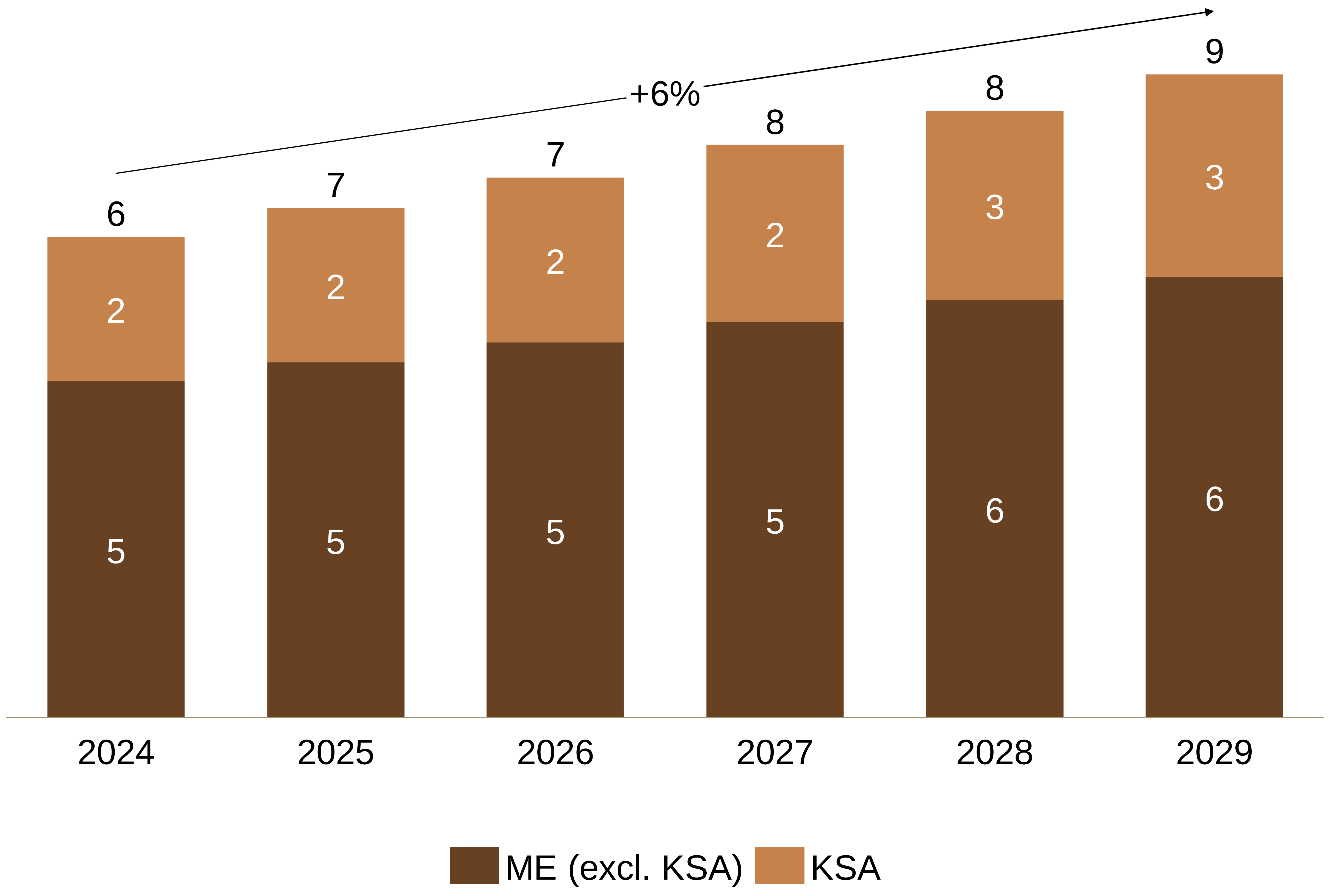
- Lower rheological properties of oil-based fluids
- Wellbore stability and filtration control
- Enhanced fluid flow and suspension

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

iktva Forum & Exhibition 2025

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

Catalyzing Supply Chains

Source: Expert interviews, Saudi Aramco data, Team analysis

aramco iktva Forum & Exhibition 2025

Value chain and key localization opportunities

	Raw materials	Intermediate process	Product formulation
Local saturation	Multiple players	Mixed players	Few players
Current value chain	• Aromatic solvents available locally	• Opportunity to localize organophilic clay, alkylphenol and lignosulphonate production Opportunity	• Opportunity to localize production of thinner/ dispersants OBM conditioners Opportunity

Success factors

	Raw materials	Intermediate process	Product formulation
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

Source: Expert interviews, team analysis

Ceramic Proppant

Business Opportunity

Opportunity profile

1

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

2

Ceramic proppant is a niche market with steady forecasted growth

$71 MM — Estimated 2024 KSA market size

9% — Forecasted 5-year CAGR

3

Attractive investment opportunities in the value chain

KSA value chain opportunities

Product formulation

Source: S&P global commodity insights, Expert interviews, Team Analysis

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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

Source: Expert interviews, Saudi Aramco analysis, team analysis

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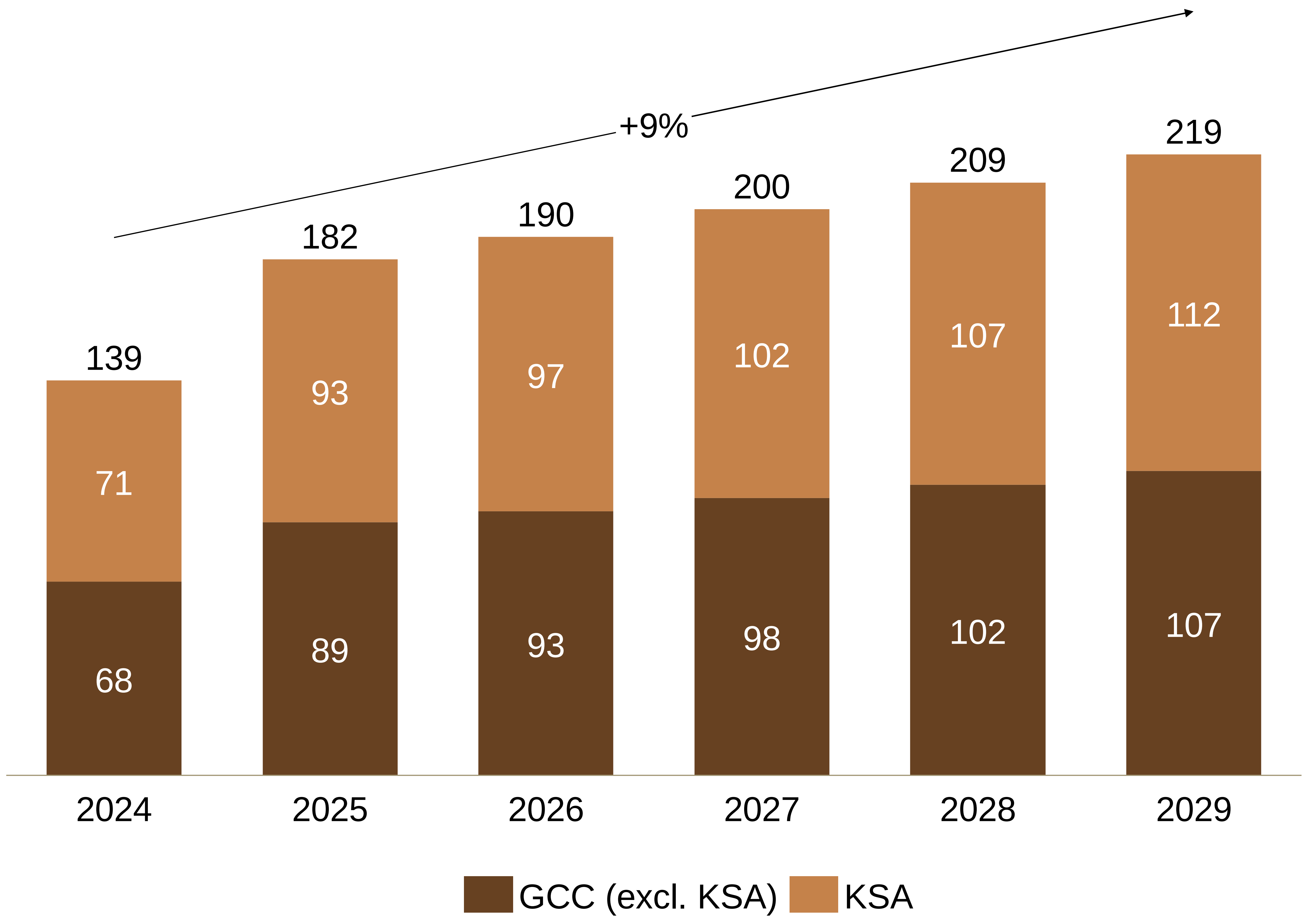
Ceramic proppant demand, customers, and drivers

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

Catalyzing Supply Chains

Source: Saudi Aramco data, Team analysis

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Value chain and key localization opportunities

	Raw materials	Product formulation
Local saturation	Multiple players	No players
Current value chain	• Raw materials such as bauxite, kaolin available and produced locally in the Kingdom	• Opportunity to localize manufacturing of ceramic proppants Opportunity

Success factors

	Raw materials	Product formulation
Technology		• Precision mixing equipment such as high-shear mixers and high-performance grinders for particle size distribution
Labor		• Material scientists and process engineers with expertise in material handling, blending, and shaping

Source: Expert interviews, team analysis

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Email: local-content@Aramco.com

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Thank You

Drilling Chemicals workshop

Catalyzing Supply Chains