



SASOL

# Responding to the changing Environmental landscape – Using Innovation to drive cost effective solutions

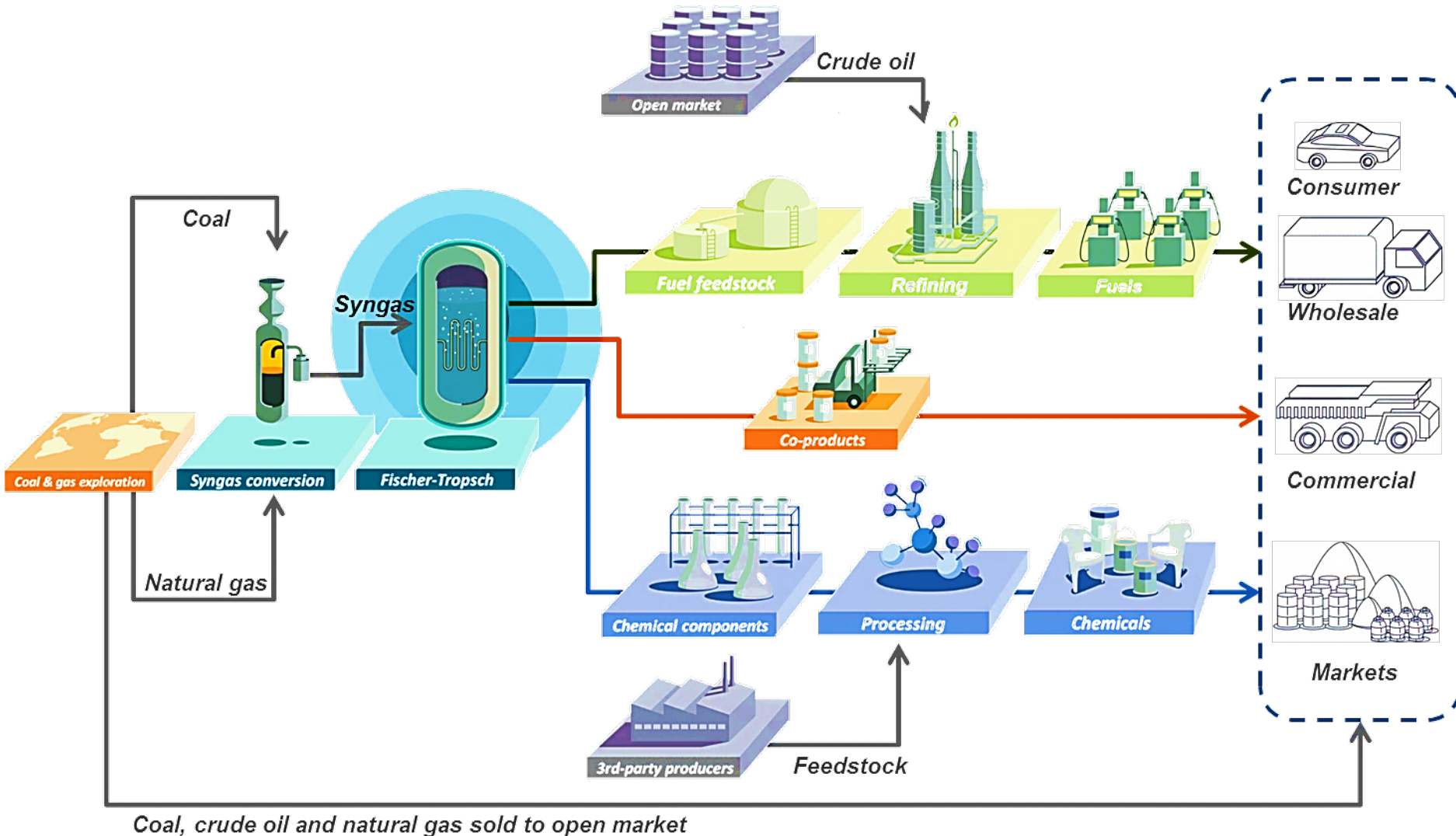
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Dr Sarushen Pillay

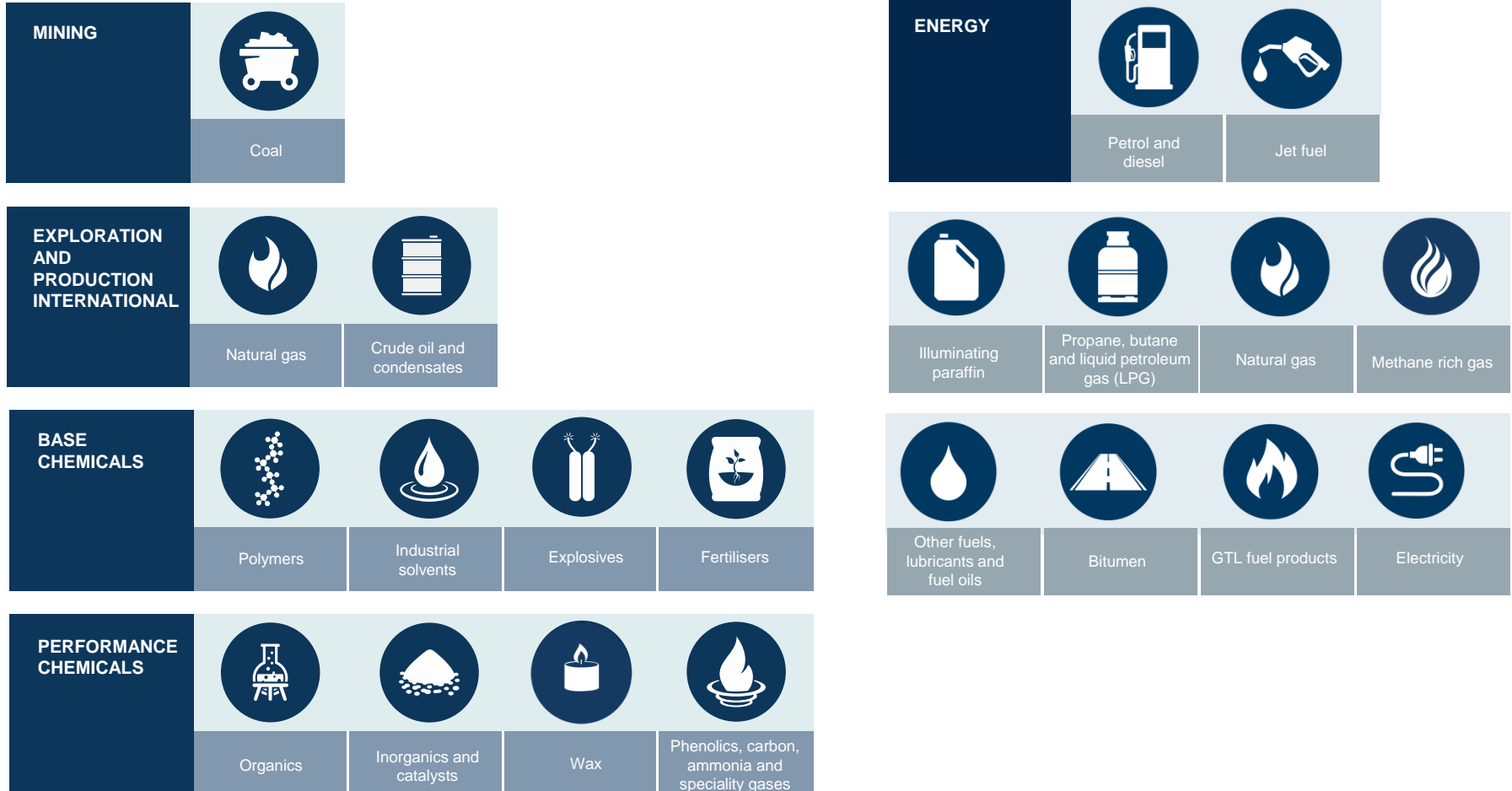
October 2017



# Sasol produces a variety of products from fuels to speciality chemicals



# We produce a variety of products from fuels to speciality chemicals



# Why do we produce waste

- Start with coal as a feedstock. Unlike natural gas, this is a complex mix of hydrocarbons, metals, inorganic inert material
- No conversion is 100% efficient – polymerisation and separation process will always result in small amounts of undesired products
- Catalytic conversions come with a finite length in terms of catalyst lifetime
- Even using bioprocesses results in the formation of excess biomass that has to be disposed of



# We operate in a rapidly evolving, environmental regulatory landscape



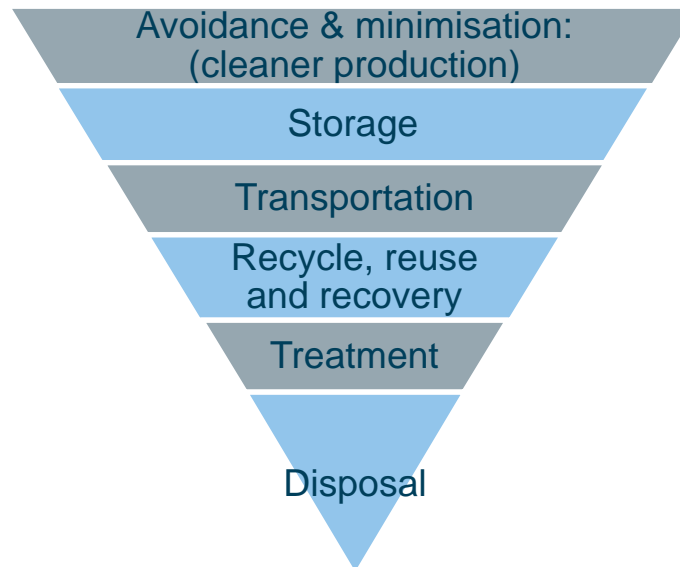
Not exhaustive

NEAR TERM (0-3 years)	MEDIUM TERM (3-6 years)	LONG TERM (> 6 years)
<b>Climate Change Management Approach</b>		
Green House Inventories and Reporting Regulations	Carbon Tax Policy White Paper and Carbon Tax Bill	
Carbon budgets and /or carbon taxes	Carbon budget review	Carbon budget review
Climate Change Bill		
<b>National Environmental Management Act 107 of 1998</b>		
Environmental offset policy framework	NEMLA 2017	
NEMLA 2017		
<b>Air Quality Act 39 of 2004</b>		
Postponement applications		
Air quality framework review		
Air quality offset guideline		
Draft strategy to address poor air quality in dense low income settlements		
<b>Waste Management Act 59 of 2006</b>		
Waste Act Implementation		
National Pricing Strategy for Waste management charge		
Industry Waste Management Plans		
<b>National Water Act, 36 of 1998</b>		
National Water Resources Strategy		
National Raw Water Pricing Strategy		

# We prioritise compliance with all applicable laws, including waste management laws



- We adopt a systematic, hierarchical and risk-based approach to manage and reduce our waste footprint, informed by the waste hierarchy
- We prioritise focus on waste avoidance and minimisation and further recognise some of our waste streams are challenging to handle and require specific disposal solutions
- Our approach is guiding us to limit on-site landfill disposal where practical
  - For a number of streams, we are reliant on both on-site waste disposal solutions (landfill and incineration) as well as third party service provider solutions
- Our technology teams continue to undertake research and development to identify and implement waste management solutions which meet regulatory requirements



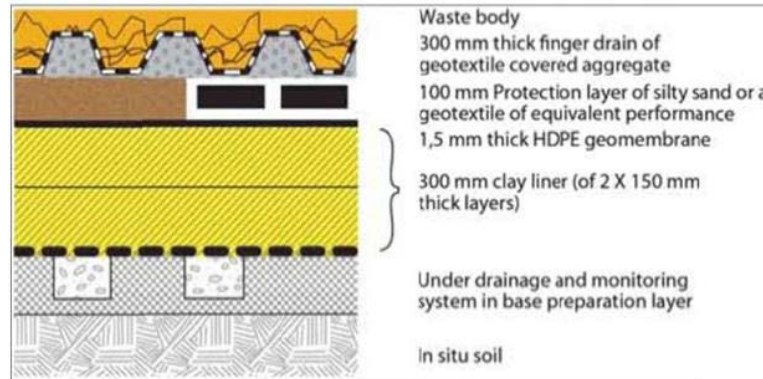
# The easy way?

## Landfill



# But....is this a sustainable alternative?

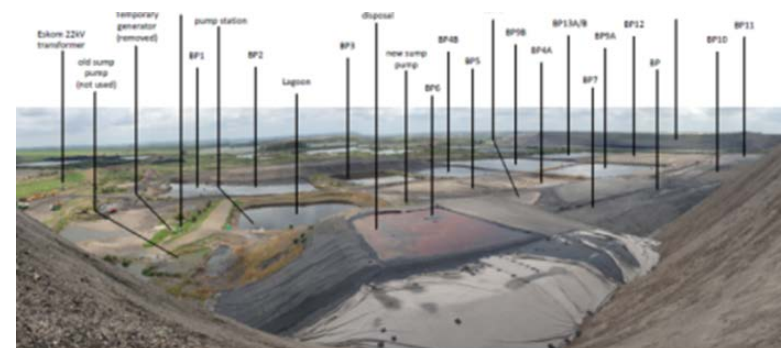
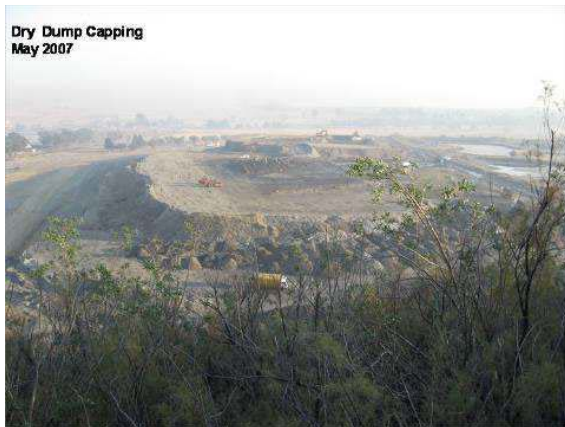
- Waste Act aims to divert waste streams from landfill. Starting with High CV wastes (>25MJ/kg) and becoming stricter and stricter until 2028
- Even for wastes that are permitted for landfill the requirements and costs are high



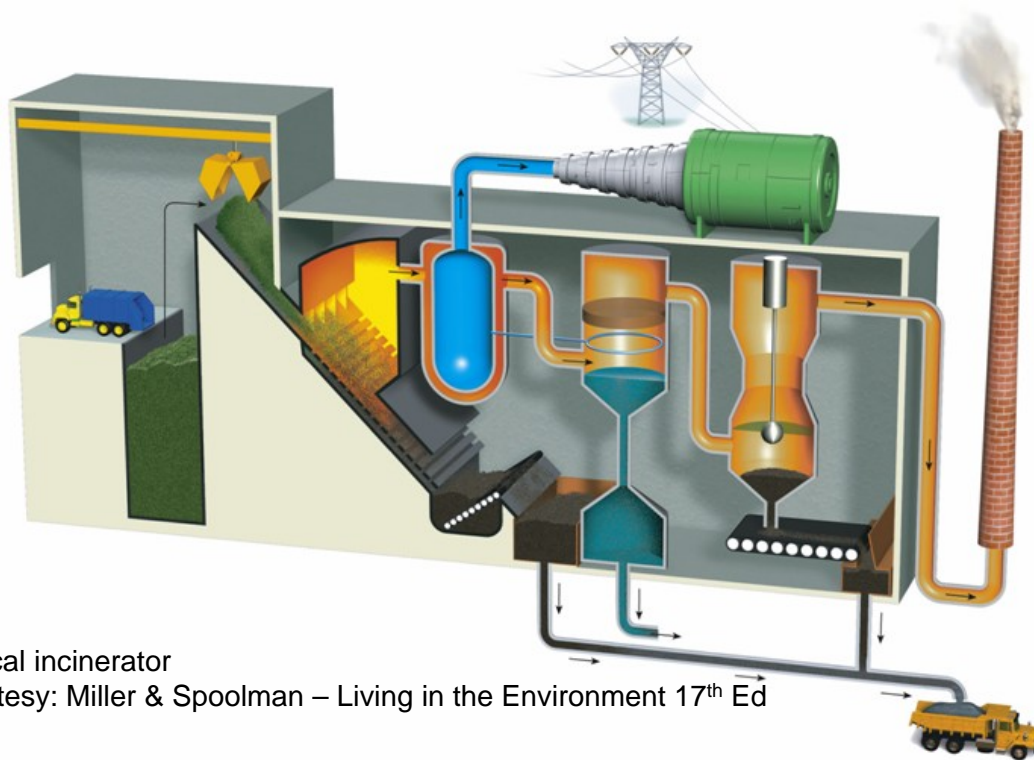


# And that's not all....

- Landfills have an ongoing legacy management issue
- Require rehabilitation and continuous monitoring



# Incineration as an alternative ?



Typical incinerator  
Courtesy: Miller & Spoolman – Living in the Environment 17<sup>th</sup> Ed

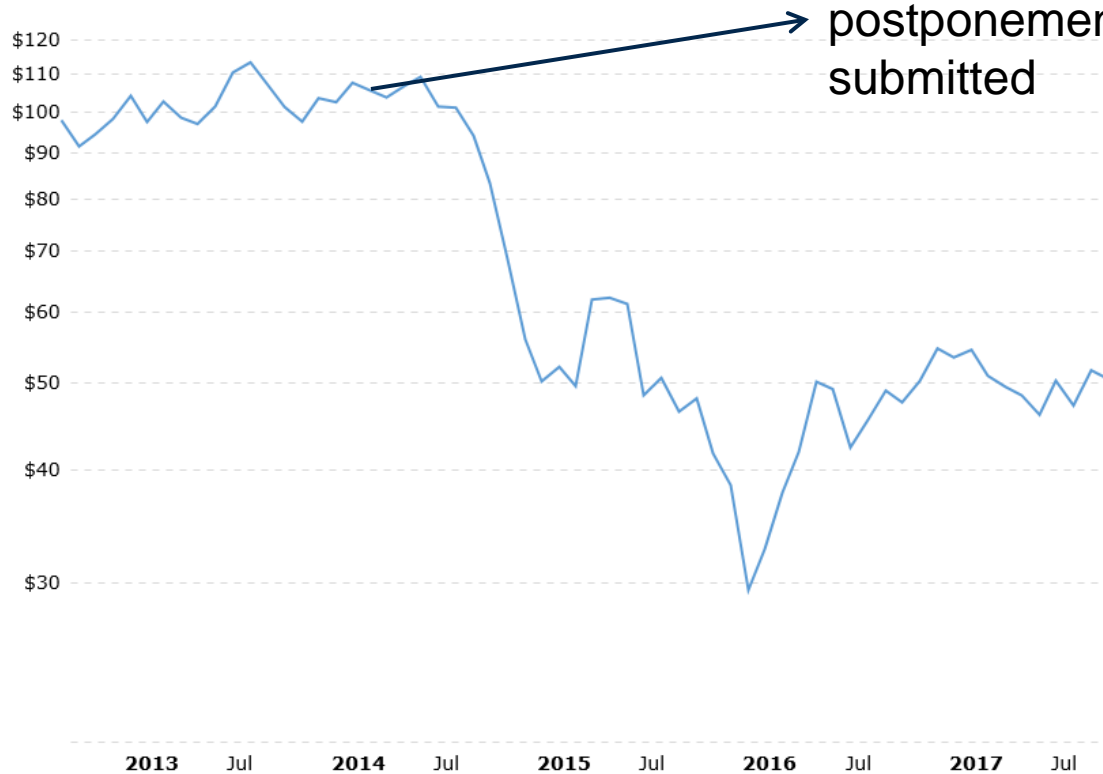


- Has the advantage of being a relatively simple, easy to operate process but....
  - Comes at a massive cost
  - Has a large physical footprint
  - Still has a residual waste footprint that has to be managed
  - Produces CO<sub>2</sub> and large amounts of wastewater

# Upsetting the apple-cart



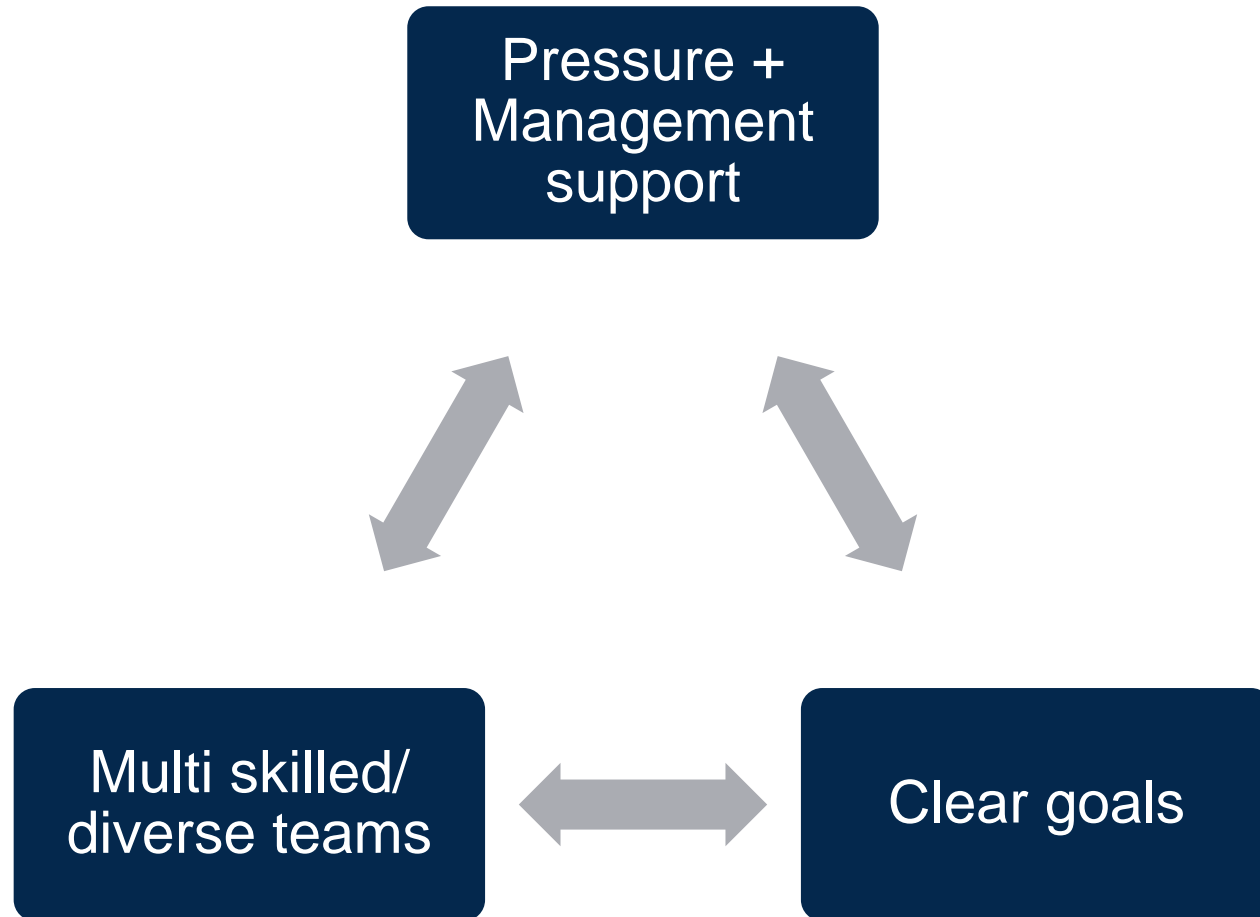
## Historical Oil Price



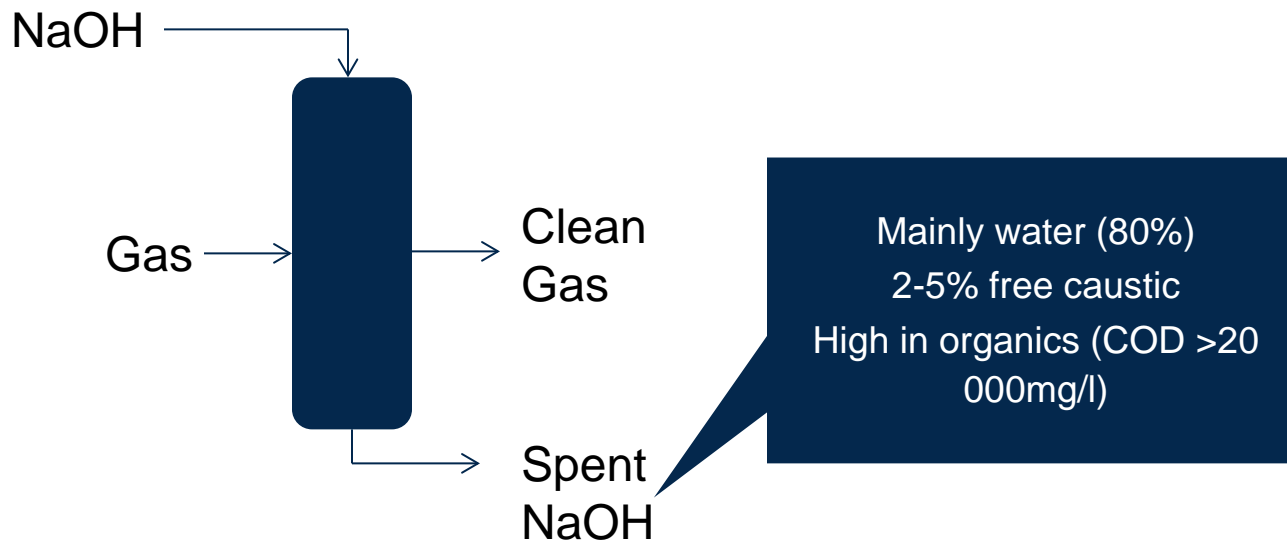
Sasol NEM:AQA  
postponement applications  
submitted

Taken from [www.macrotrends.net](http://www.macrotrends.net)

**The external environment can easily change forcing plans and roadmaps to be re-evaluated**



# Case study 1: Spent caustic



- **Current treatment is to incinerate**

- However incineration is very energy intensive
- In order to meet 2020 NEM:AQA air quality standards extensive retrofitting will be required
- Retrofitting in a brownfields plant is very expensive and difficult
- Landfilling prohibition on disposal of liquid wastes
- Creates a large wastewater stream high in salts

# Creating a climate for innovation

Urgent requirement to develop an alternative supported at the highest level in the organisation

Pressure +  
Management  
support

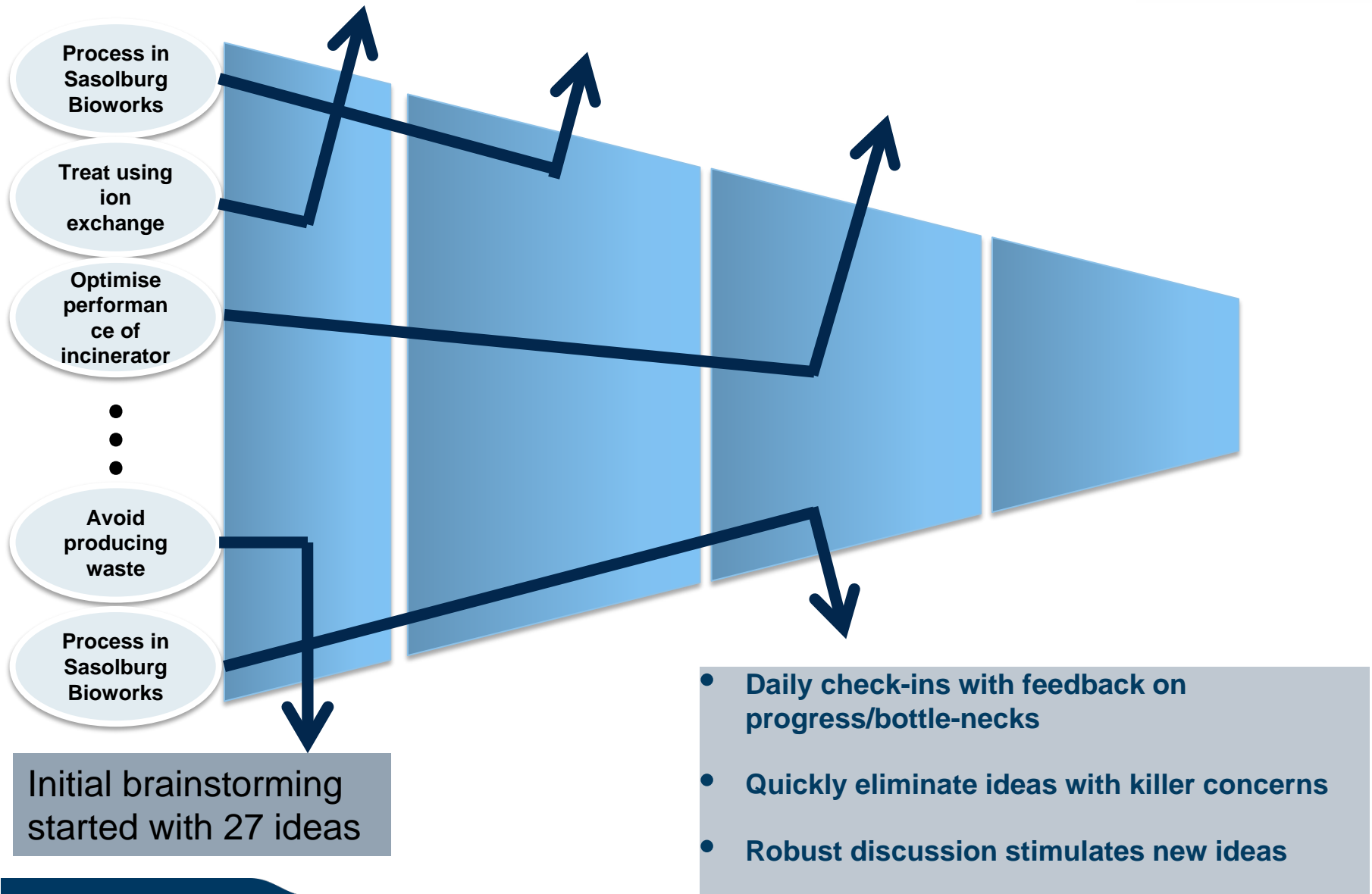
Task team made up of operations personnel, microbiologists, chemists, process engineers from different parts of the organisation

Develop a low cost alternative to incineration by mid 2018

Multi skilled/  
diverse teams

Clear goals

# Brainstorming



# Eventually the eureka moment comes!

- Sasol's Secunda operations treat a massive volume of highly varied complex effluents
- Main effluent stream is generated from the Fischer-Tropsch reaction which produces a highly acidic wastewater
- Stream need to be neutralised before treatment
- Bioprocesses can be used to treat a wide range of organics





# What if?

- Spent caustic is highly basic
- Organic components are readily biodegradable
- Could the spent caustic stream be combined with the acidic effluent and be treated in a bioprocess?
  - Theory - supports 
  - Lab scale toxicity tests – supports 
  - Piloting work – supports! 
  - Can this practically be implemented? → YES! 



# Does this approach consistently work?

## Acrylate waste case study



- Early in 2017 Sasol faced a challenge with the disposal of an acrylate waste stream
- The waste had had been handled by a 3<sup>rd</sup> party waste provider
- Early in 2017, Sasol was informed that due to odour concerns the stream could no longer be processed



# Does this approach consistently work?

Urgent requirement to develop an alternative supported at the highest level in the organisation

**Pressure +  
Management  
support**

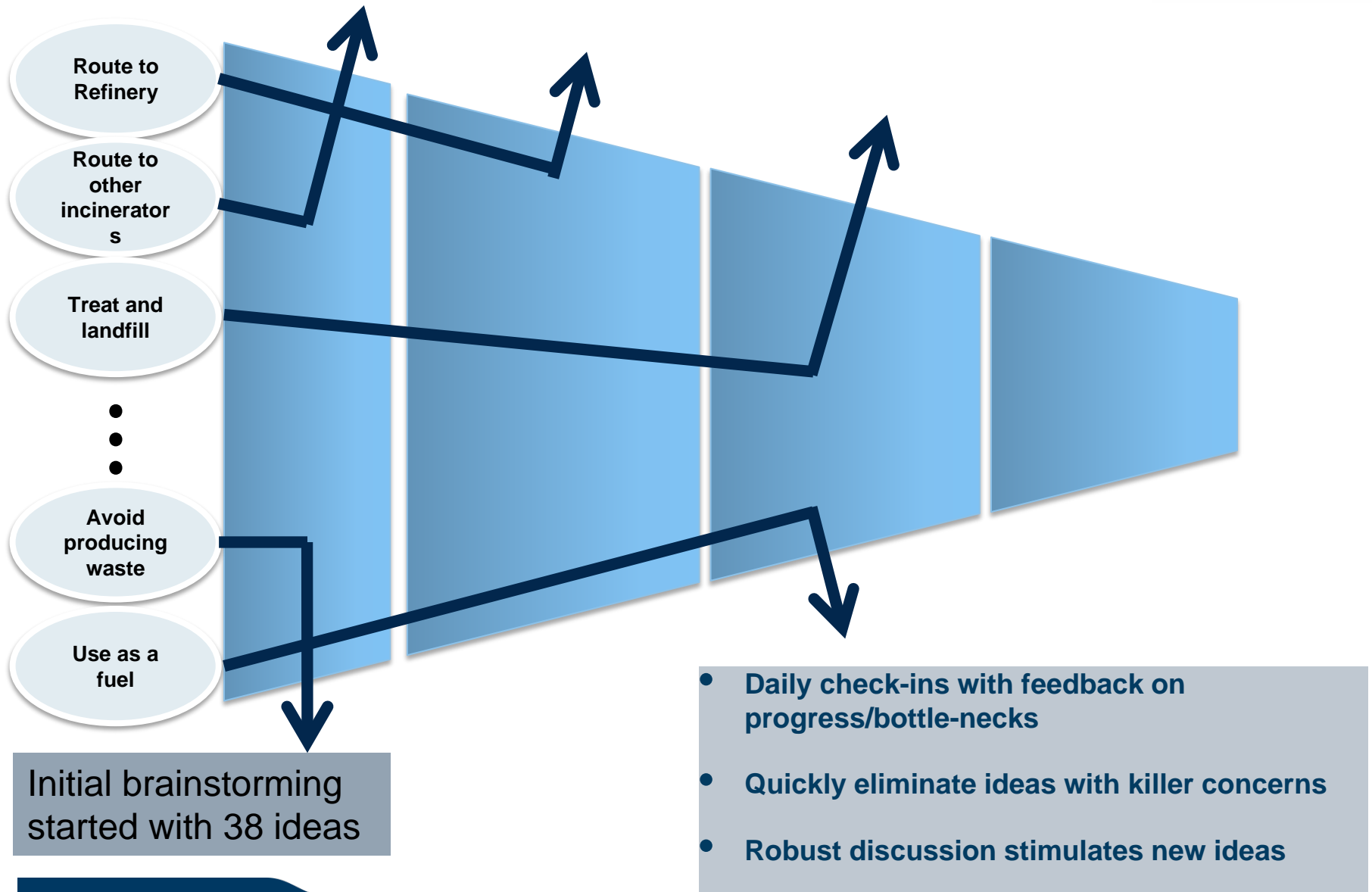
Task team made up of operations personnel, microbiologists, chemists, process engineers from different parts of the organisation

Develop an immediate waste handling solution to avoid impacting production

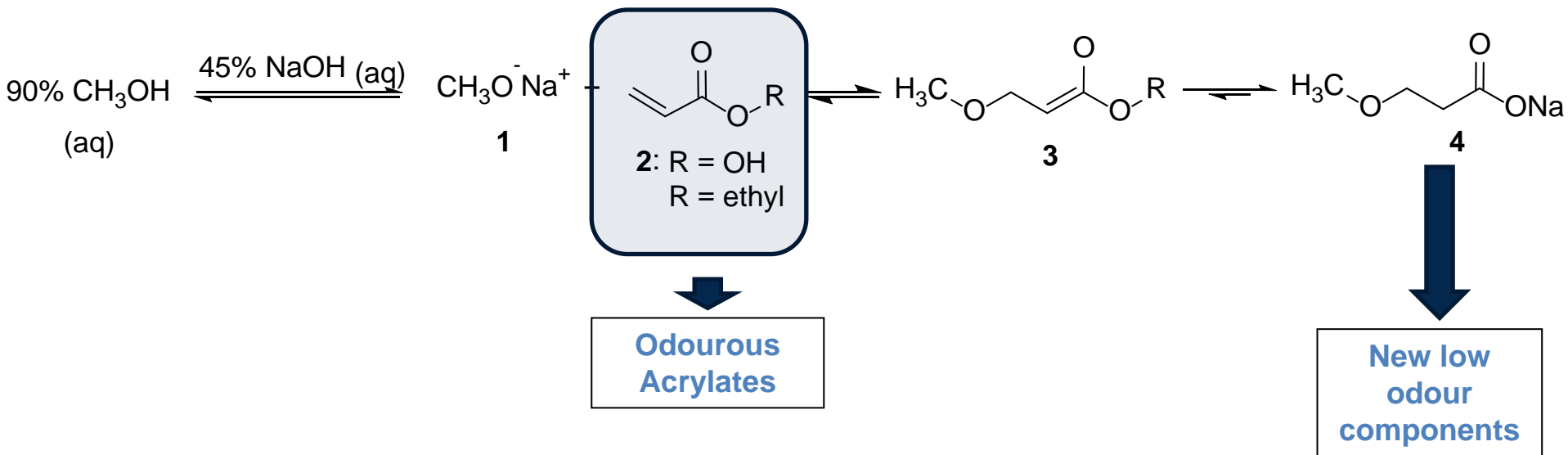
**Multi skilled/  
diverse teams**

**Clear goals**

# Brainstorming



# And once again....Eureka!



- **With an integrated task team the idea could be quickly evaluated**

- Theory - supports ✓
- Lab scale toxicity tests – supports ✓
- Piloting work – supports! ✓
- Can this practically be implemented? → YES! ✓

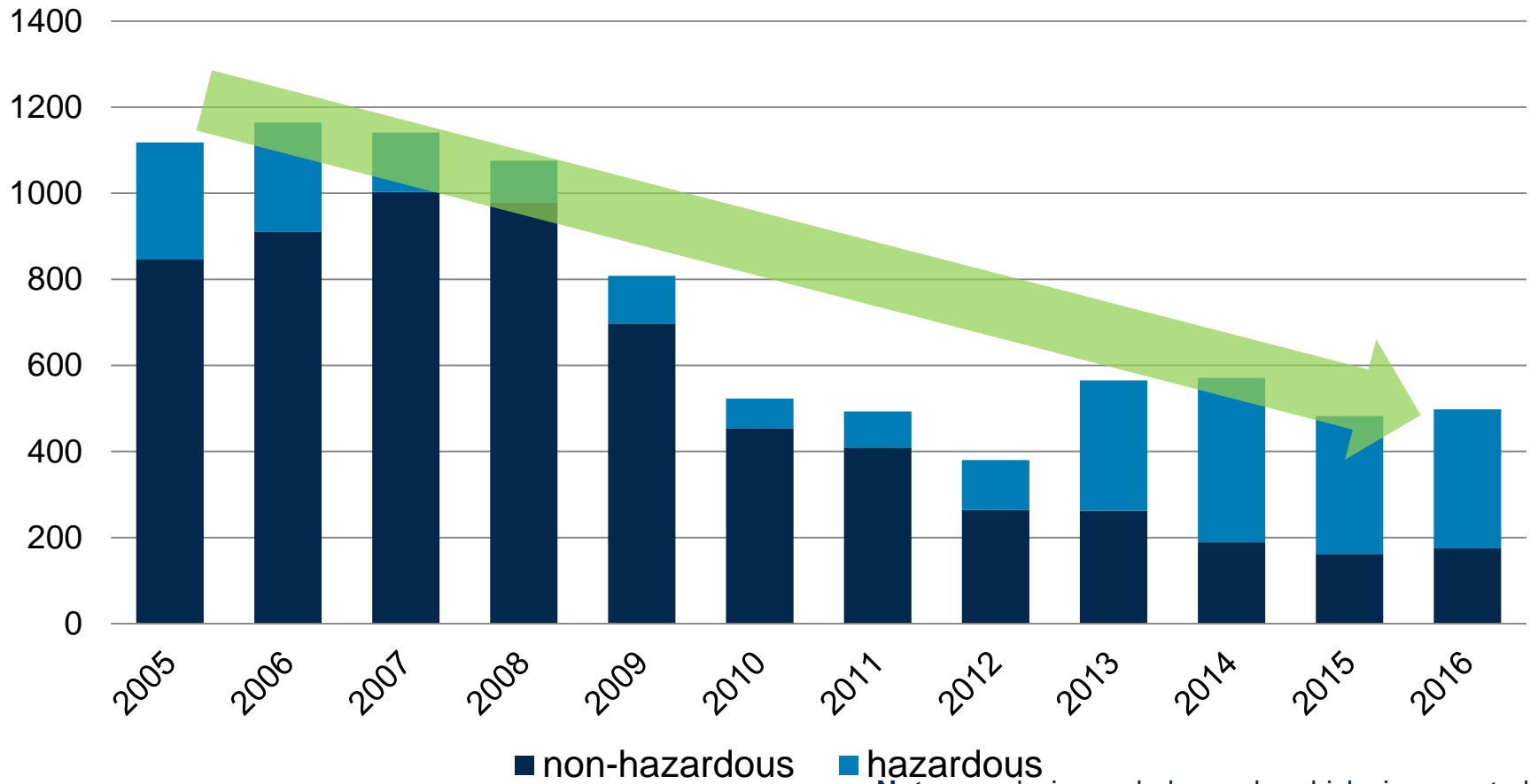


# This approach yields results!



► Our total waste generation has decreased over the past decade

## Sasol Group waste generation (kilotons): source SD reports 2005 - 2016



Note: analysis excludes ash which is reported on separately

## Watch out for these

- Beware the bureaucrat and the corporate ‘system’ – easy to stifle innovation. Corporate systems struggle to deal with disruptive ideas. Structures, processes and corporate culture can often work against innovation
- Absolutely critical to get the team structure correct. Watch out for:
  - “job description”
  - “lone wolves”
  - Negativity - Phrases like – ‘it can’t be done”, “there’s not enough time”, “you’re asking the impossible”
- Get proper buy-in from all stakeholders
- Create a culture where ALL voices are heard. Be wary of a climate of fear.
  - Fear of failure,
  - Fear of making mistakes,
  - Fear of speaking out

# We never fail; We either succeed or learn

- Crises brings about heightened energy levels (positive and negative)
- Strong leadership can focus the energy to be channelled in the direction to finding solutions
- Diversity in thinking is the first key to solving complex challenges
- Having a clear common goal is the second key to solving complex challenges
- Strong management support is the third key to solving complex challenges – this unlocks resources, budget, collaboration



**“It always seems impossible until its done” - Madiba**