Topside Sand Management

Paradigms, priorities and implementation strategies

MERPRO

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Perspective on Topside Sand Handling

Collection of field experiences from around the world.
Patterns emerge:-

- Different sand management philosophies
- Different priorities
- Different implementation strategies

Perspective on Topside Sand Handling

Clear strategy – live with sand and/or pro-actively manage it

In denial

No clear strategy – can end up up to your neck in it!

Different strategies

- Don’t need topside sand handling
- Reliance on retrofit
  - In more mature provinces where sand has broken through
    - not engineered in
  - In new developments where sand is not predicted until later in field life
    - engineered in at design stage
    - not engineered in
- Install from day one
  - Increasingly the approach as production from sand producing fields increases

Don’t need topside sand handling

Reliance on downhole control – no provision for later installation of topside sand handling

- Increasing cost of sophisticated downhole control

But - is it sand or fines?

- Definition of fines varies – but typically <50 microns
- Are fines predicted?
- Is sand predicted?

Potential for screen failure

Reliance on downhole control

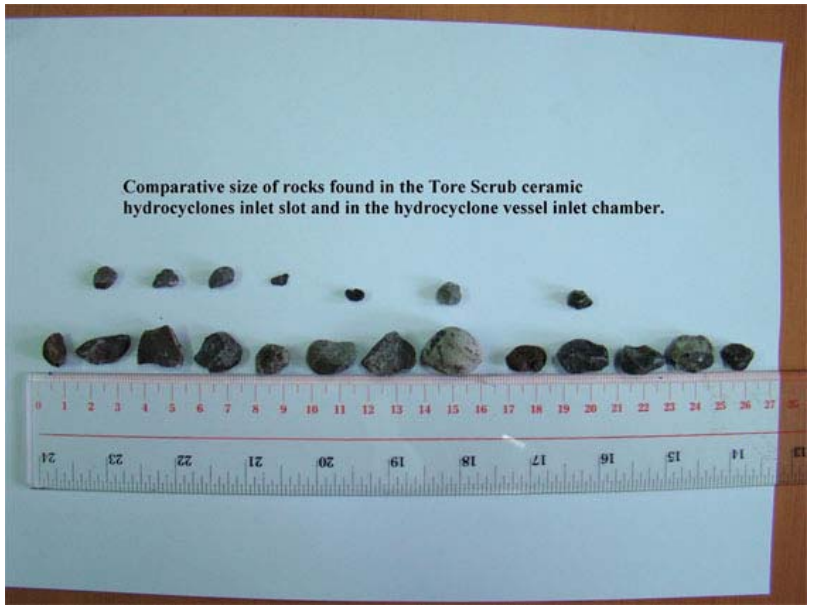
However, risk wells will fail

Within life?

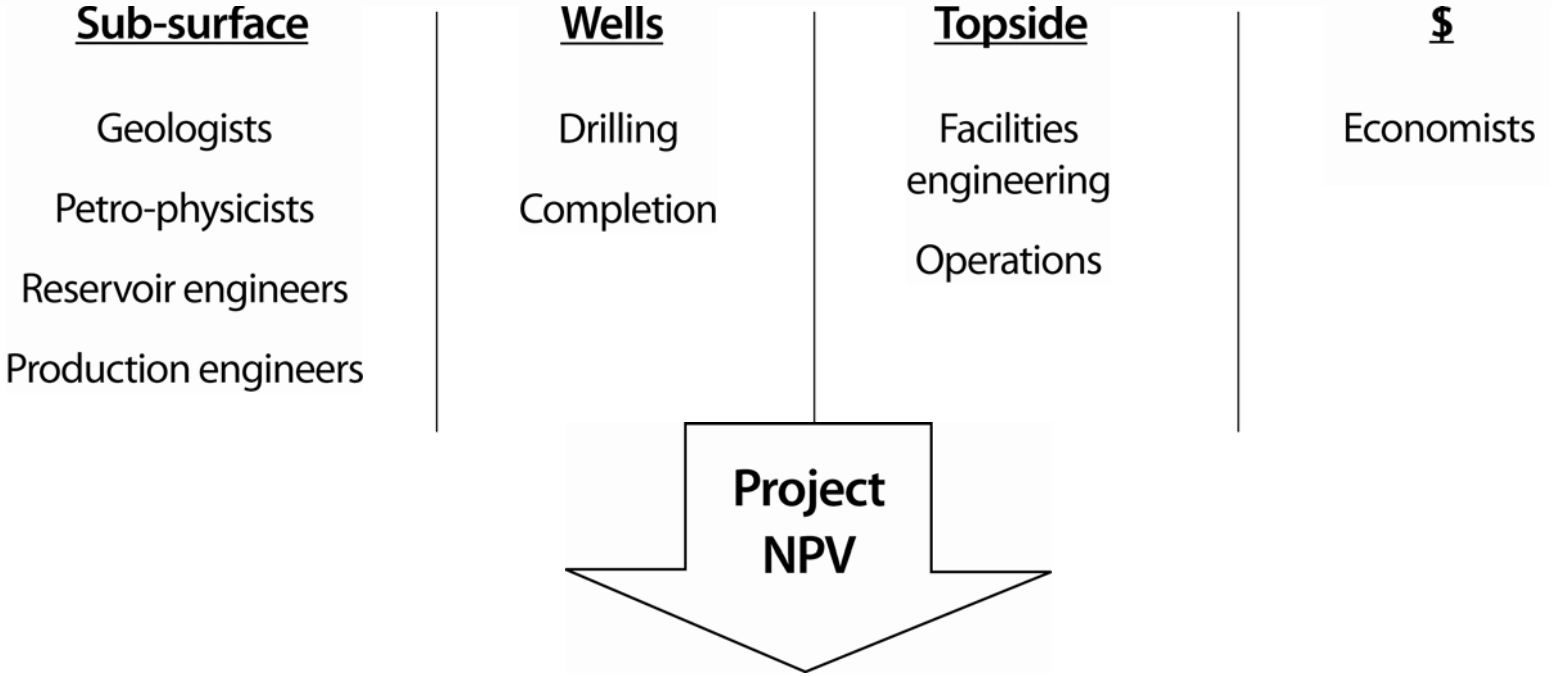
Within 1 year?

Within 1 month?

Several wells per field....



Project



Balanced approach required. If too much emphasis given to one area, could be storing up problems for later.

NPV

DUE TO SAND!

Potential for failure – so need to look at sand management over life cycle of field

Benefits of an holistic approach to Sand Management

Requires integrated team approach

Jeremy Clarkson -

“Fiat Multipla was designed by a team for the top half and a team for the bottom half

- who never met”

Holistic approach to sand management requires multi discipline approach – reservoir, wells, surface, export. Sand Management Teams

Factors behind philosophy

Don’t need topside sand handling -

- No sand!! But where it’s predicted, still resistance
- Perceived cost, weight, space issues
- Lack of confidence in topside equipment
- Many examples of blocked and inoperable systems

So why resistance to installing Topside?

Perhaps bad experience with equipment?

Blockages and erosion

= Lack of faith in equipment

So why bad experiences?

Reasons for not operating it?

- No sand!! – initially. Sand builds up (un-noticed?)
- Unfamiliarity with equipment
- Overly complex – operators have given up!
- Cost savings during installation – manual!
- Reliability and effectiveness problems

Becomes blocked through lack of use

- Fuels the perception that topside sand handling equipment is unreliable and not very effective.

Lack of Topside Sand Handling

Can result in:

- Shut-in topsides facility
- Requires shutdown to manage sand - bed space!
- Operational issues – OIW
- Producing well shut-in
- Costs of shut down and dig out
- Lost/deferred production – revenue impact

Sand Management Philosophy

Allowing sand to flow

"Allowing sand to be produced can be a profitable business because this also lets oil flow more freely" - *Statoil*

Moved from Maximum Sand Free Rate (MSFR) to Acceptable Sand Rate (ASR)

On Gullfaks, 3,000 additional barrels of oil/day produced from 3-4 wells

More info in SPE94511 Production enhancement from sand management philosophy. A case study from Statfjord and Gullfaks, J Andrews et al, Statoil

Development of Topside Sand Handling technology

So what has contributed to this change in strategy?

Development of technologies now proven in the field provide reliable and efficient on-line sand removal

Leading to an increasing number of operators opting to install topside sand handling from day one

Some operators looking at true cost of sand – capex, opex and production losses

Topside Sand Handling

Why Topsides?

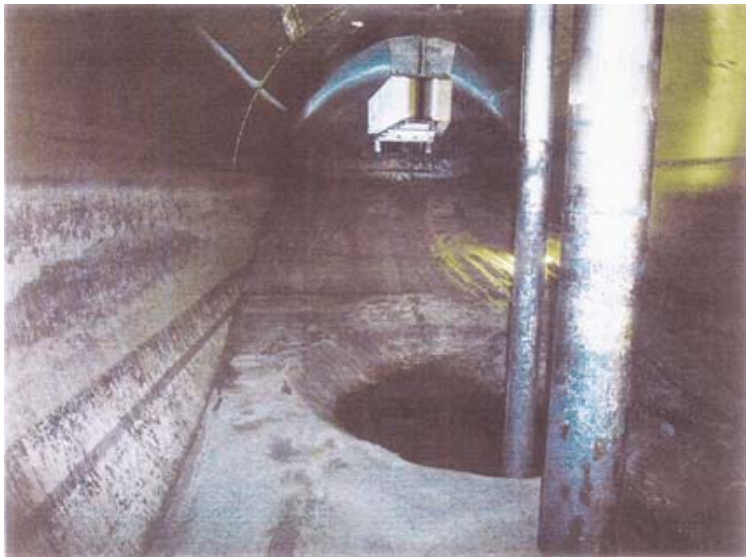
- Optimise Investment Spending
- Manage Failure
- Manage Fines
- Maximise Production
    - ***Above all – Minimise Risk***

When to install Topside Sand Handling?

When solids are causing a problem topside

Accumulating in separators

- Reduced residence time
- Poorer oil and water quality
- Solids carry over

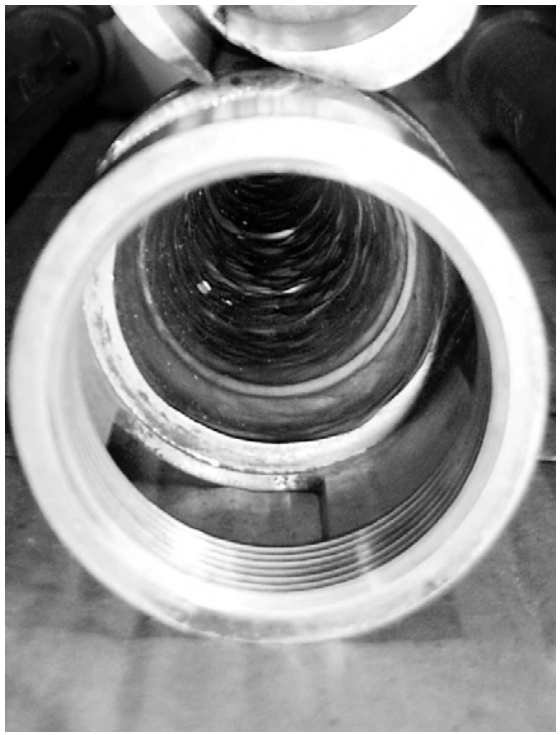


Blocked internals

Vessel hygiene

When to install?

Erosion in liquid/liquid hydrocyclones



Can end up treating the symptoms – not the cause.

Retrofit

When provision made at design stage for later retrofit

- Reduces extent of modifications
- Tie in points in place
- Correct nozzle sizes/locations on vessels
- Reduces cost and minimises duration

When no provision made

- Bigger job, more costly, takes longer
- Bed space problems

Retrofit

If sand handling is given priority, not a problem.

However, more pressing issues frequently emerge

- Bed space and shut down priorities take over
- Too many simultaneous operations

Retrofit deferred, sand issues intensify

- Continues to accumulate in vessels – more frequent clean out
- Blocked de-oiling hydrocyclones – more frequent clean out
- Produced water quality deteriorates – financial penalty
- Oil quality deteriorates – oil export problems/penalties
- Potential for erosion in vessels and pipework

Can end up treating the symptoms – not the cause

Retrofit

Good understanding of current and predicted sand issues
- Monitoring

Decide installation strategy
- Wellhead desanders
- Online vessel desanding
- Produced water desanding
- Sand clean up for overboard discharge/ship to shore

Space and weight issues to consider

New developments

In new developments, installation - when prioritised - is straight forward

Decide installation strategy

- Wellhead desanders
- Online vessel desanding
- Produced water desanding
- Sand clean up for overboard discharge/ship to shore

Obtain costs – establish business case

To get the best out of topside sand handling equipment

Field experience indicates that operators who get the best out of their topside sand handling equipment

Have a clear strategy for installation and operation

Have prioritised it

Operate it regularly – part of daily routine

Topside sand handling equipment

Mitigates against the risk of sand breakthrough earlier than predicted

Mitigates against the risks of screen failure

Maintains oil in water quality

Maintains separator hygiene

Reduces risks of erosion due to sand

Topside sand handling equipment

Provides life of field solution

Maintains production

Eliminates unplanned shut downs to remove sand

Maximises revenues

Topside Sand Management Today

Better understanding the issues on surface

Holistic approach to Sand Management

Emergence of companies specialising in topside sand handling solutions

Availability of competent topside sand handling technologies

Perspective on Topside Sand Handling

Have a clear strategy for sand management from reservoir to topside