



Evaluation of Non Productive Time of Geothermal Drilling Operations – Case Study In Indonesia

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Presentation Outline

- Introduction
- NPT factors
- Case study

Introduction

Introduction

- There are many factors and events that impact the time and cost to drill a well.
- Asset management drilling tools and techniques help to:
 1. Detect new opportunities, quantify and address removable lost time.
 2. Analyze the major problems in a comprehensively and structured manner.

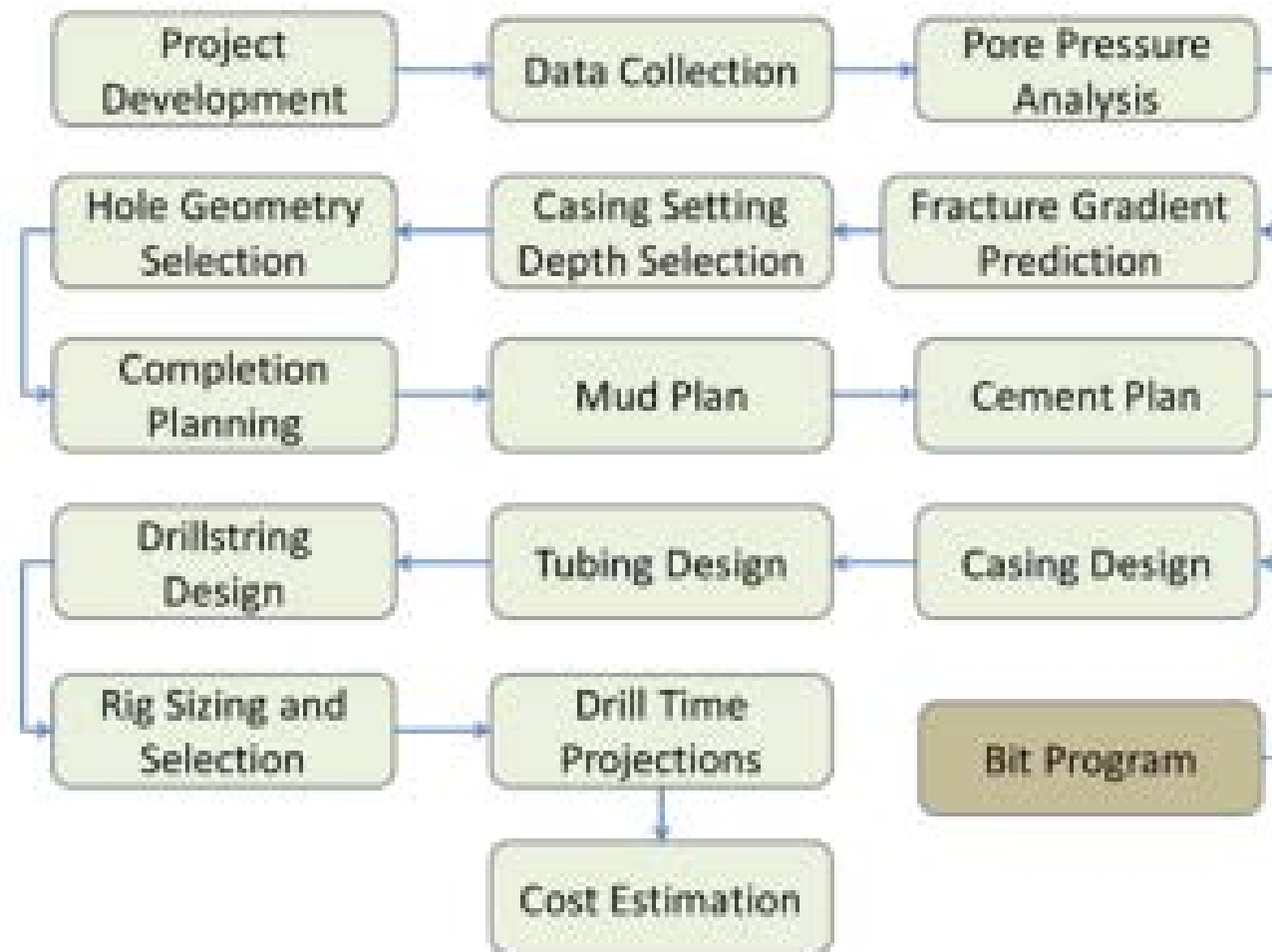


Figure 1: Flow path of drilling design and operation (Adams, 1985)

NPT Factors

NPT Factors

The factors that impact the time and cost to drill a well are (Lagrec, 2008):

Well characteristics

- The length, diameter and curvature of the hole trajectory.

Well complexity

- The nature of the geological formation, the depth of the target, the trajectory of the wellbore, the experience of the contractor, and the technology applied.

Site characteristics

- Geographic location, and environmental conditions.

Operator preference

- How to drill and the manner in which to execute the drilling operation.

NPT Factors (cont'd)

The factors that impact the time and cost to drill a well are (Lagreca, 2008):

Drilling characteristics

- The hardness of formations, pressure regime, and drilling plan.

Formation evaluation

- Time spent on coring, logging, reaming, and testing is “flat” time. high-impact Non-Productive Time events involving complex tools and operations typically require more time and effort.

Technology

- New technology is expensive, but if the technology reduces drilling time or improves the efficiency or safety of the operation and becomes widely adopted, costs decline, and performance efficiencies will improve and become absorbed within process.

Procedural aspects in geothermal drilling planning

Before Drilling	While Drilling	After Drilling	Drilling Problems
Fulfillment of drilling equipments	Monitoring drilling parameter	Drilling reporting system	Lost circulation
Equipments and rig transportation, rig preparation	Formation drilling, circulation, coring	Daily report system	H ₂ S
Drilling program and technology, etc.	Logging GR, Resistivity, PTS, etc.	Waste management, etc.	Stuck pipe, etc.

Geothermal Wells Case Study

Field Case 1

- Figure 1 shows a case study of exploration drilling time in Field X, Indonesia.

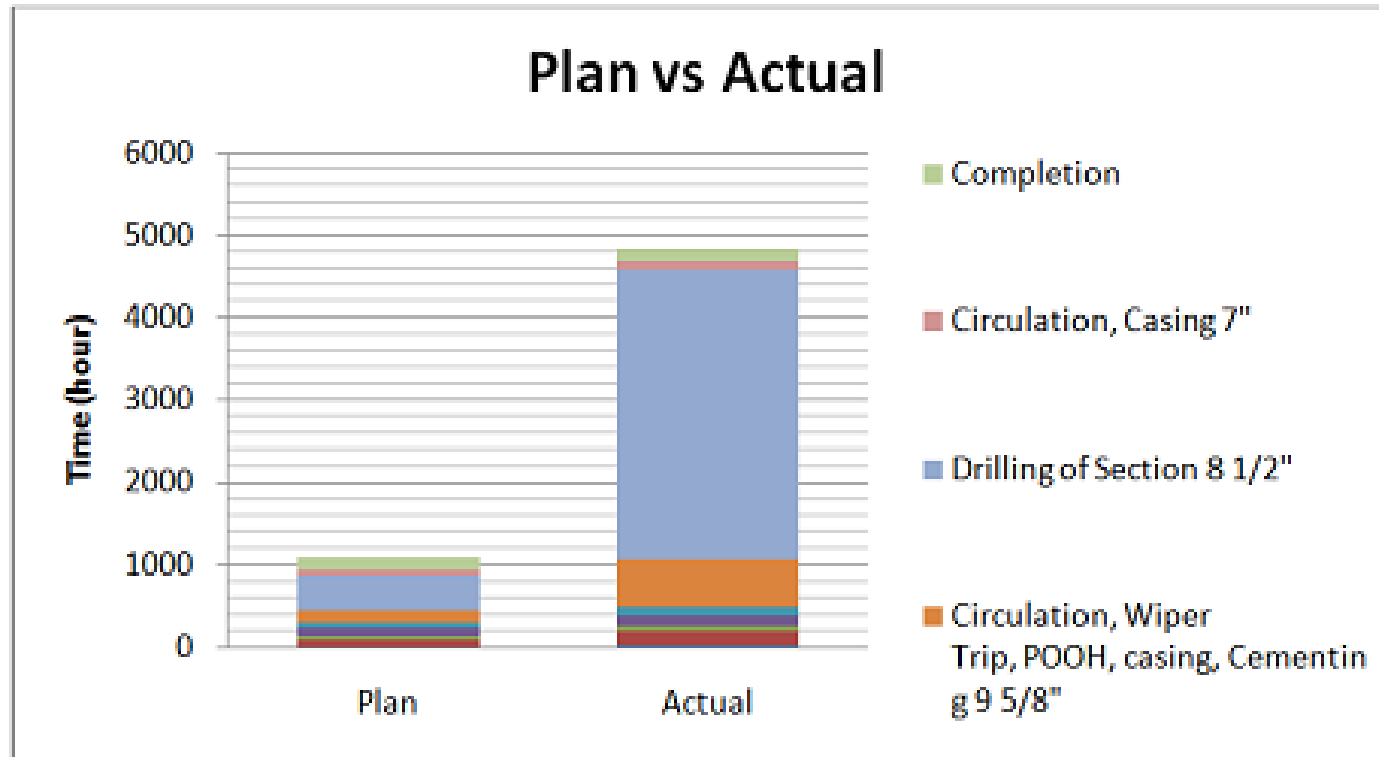


Figure 1: Plan and Actual Drilling Time of Field X

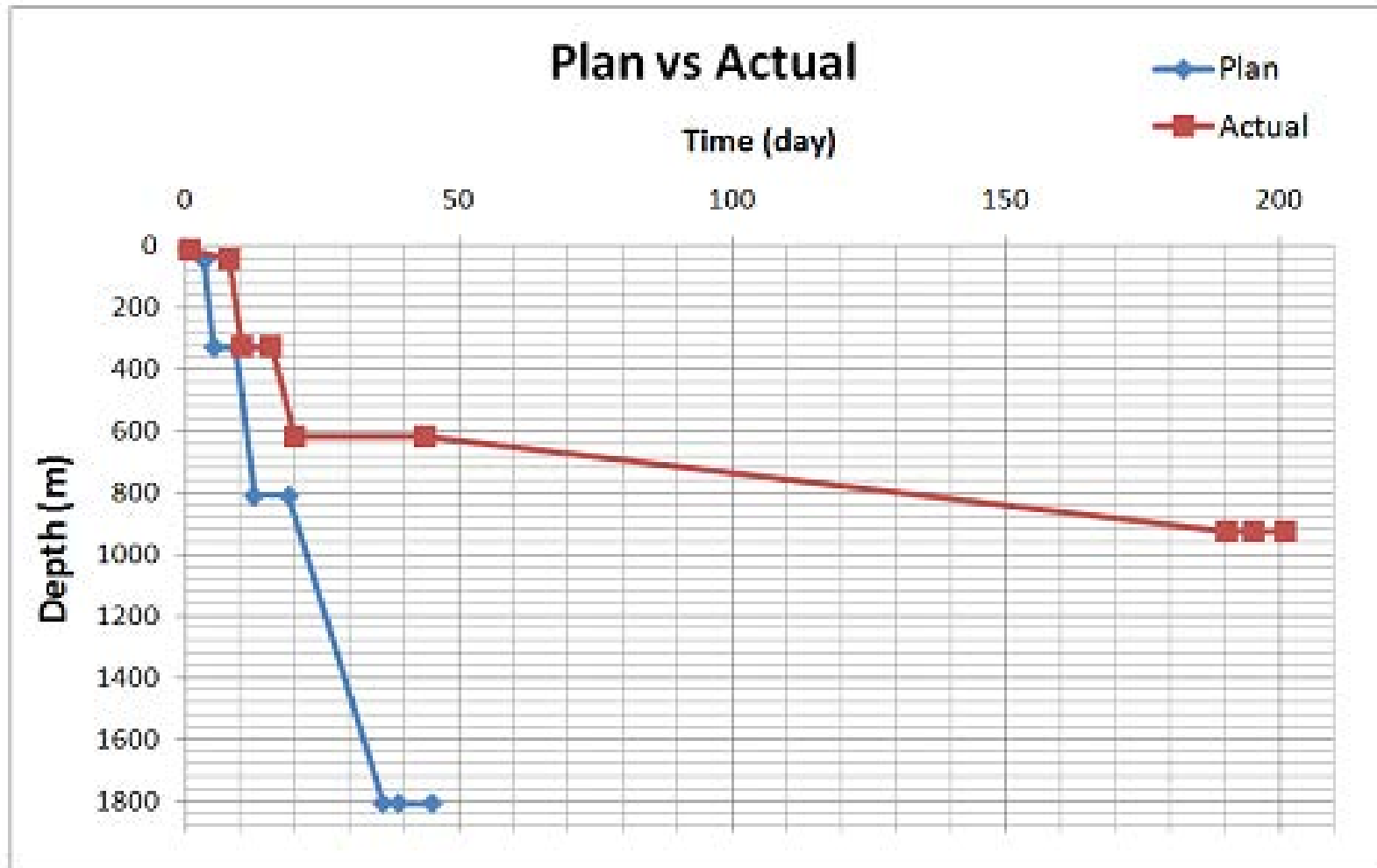


Figure 2: Time vs Depth Graph of Field X

Field X NPT analysis

- The stuck pipe occurrence was major source of lost time.
- The pack off happened while drilling operation dominantly caused by inappropriate hole cleaning program.
- Fishing operation done to recover the lost parts of drillstring in hole.
- The stuck pipe and fishing operation to recover the string after stuck are major source of NPT in field X.

Percentage of Time

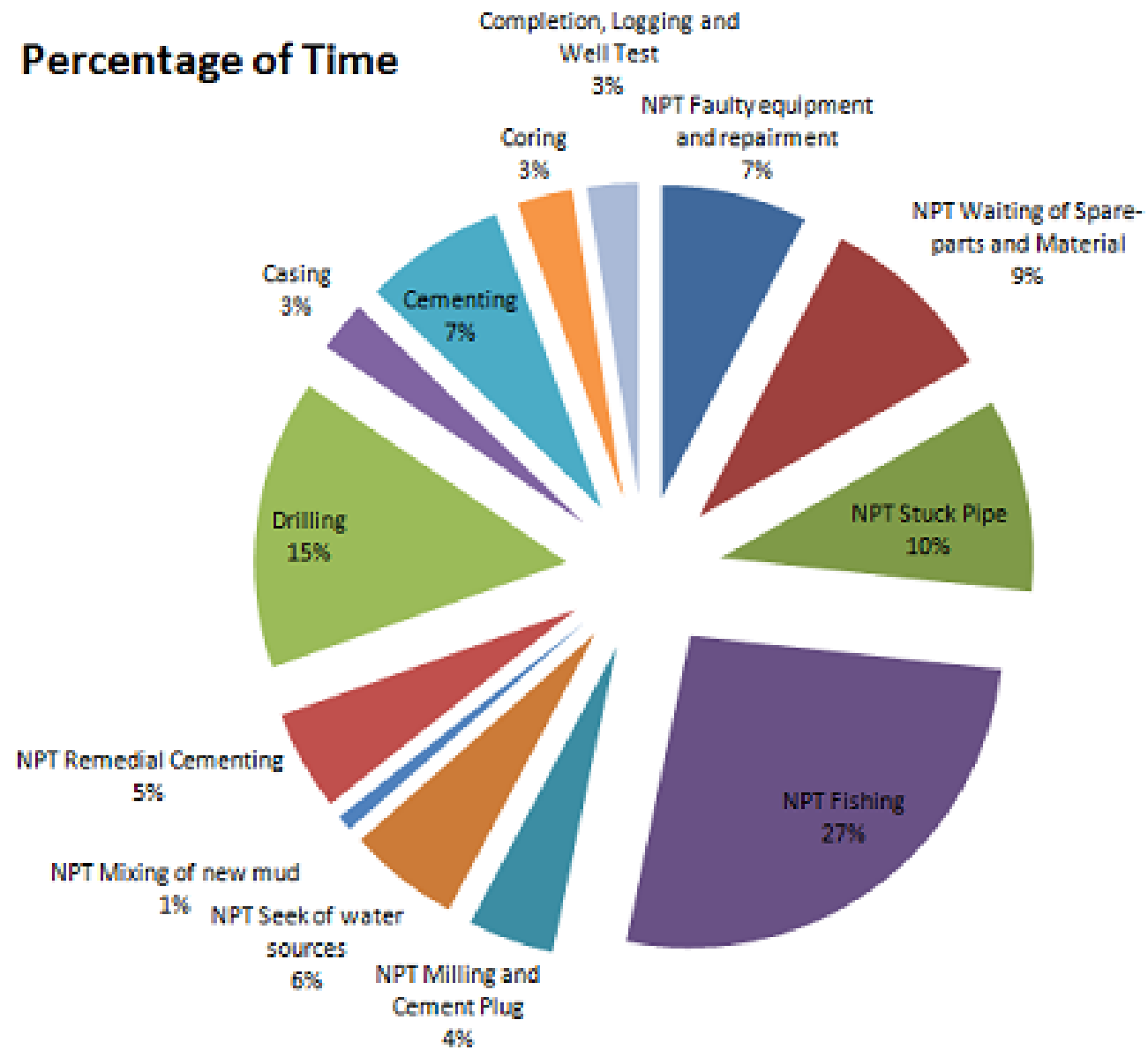


Figure 3: Time Breakdown Percentage of Field X

Drilling parameter that influence the NPT

1. Hole cleaning
2. Equipments performance
3. Drilling and completion process performance
4. Preparation and planning of drilling operation

Accumulative of Time

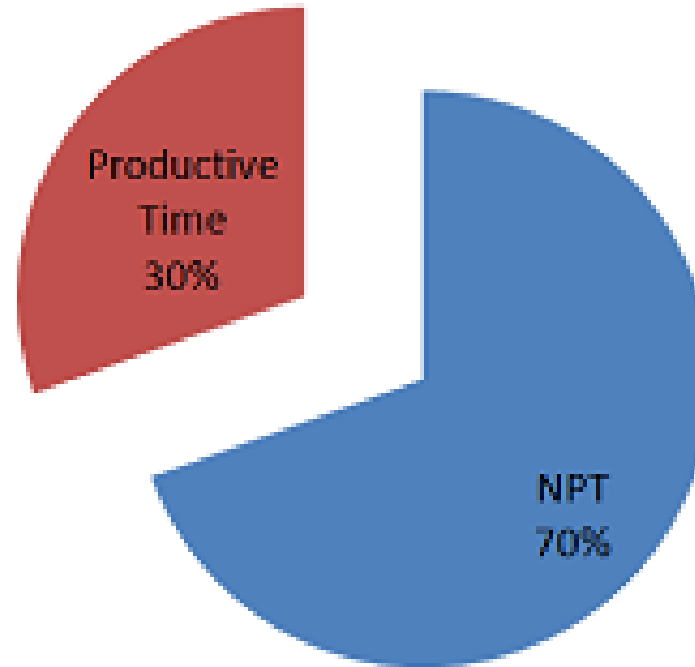


Figure 4: PT vs NPT Chart of Field X

How to solve NPT problems?

- Drilling and completion operation must be done properly according to the plan.
- By the proper planning, precise execution, and careful evaluation of drilling, the risk and operation error will be reduced.
- Minimizing the risk and operation error will reduce the NPT and reducing the NPT will decrease the non-productive cost significantly.

Conclusion

- **The planning of drilling operation is critical phase** to push down the technical limit in achieving the perfect well drilling time.
- **The drilling problems must be accounted** in planning process to reduce the risk of lost time occurrence. The case study describe that **the improper planning could lead to significant lost time.**

THANK YOU