TA OPTIMIZATION – HOW TO MEET CHALLENGING OBJECTIVES

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Background:

- Engineer Electronics / Electro technology
- International MBA, MIT (Massachusetts Institute of Technology)

Responsibilities before T.A. Cook:

- Electro technician, ABB Overhead lines
- Electro technician, Siemens

Consulting focus:

- Maintenance strategies and -management
- Shutdown: Planning, Scheduling, Optimisation
- Work execution excellency: Lean, Kaizen, 6-Sigma, SMED

Focus industries:

- Petro / chemical, asset intensive industries

T.A. Cook Consultants

Established 1994

Offices:
Berlin
Birmingham
Calgary
Hong Kong
Houston
Paris
Raleigh
Rio de Janeiro

AGENDA

1	TA Optimization Introduction
2	T.A. Organization
3	Planning and Scheduling
4	Work Execution Productivity
5	Risk Management
6	Questions & Answers

With the recent drop in oil prices, corporate initiatives aimed at controlling & managing costs have been intensified

- Approximately half of all planned turnarounds are **delayed by more than 20%**, while over **80% fail to stay within budget** by more than 10%.
- During a time when oil prices were higher, deviations in duration and costs were easier to absorb within the industry.
- To remain competitive in today's economic environment, companies must **effectively manage the costs** associated with executing turnarounds on **time and on budget**.

Challenging times - many refineries have taken initiatives to accommodate the lower oil prices to remain competitive

- In some industries, such as the (petro-) chemical industry, initiatives have gone as far as to **avoid completing planned** (shutdowns, turnarounds, outages) **and unplanned stoppages** (reliability initiatives) – **undesired results are becoming visible!**

- In Europe, many refineries have adopted **enhanced TA Optimization and/or TA Excellence programs** which encompass the key elements required to **successfully complete turnarounds safely and efficiently**.

- Drastic changes in market conditions require **organizations to adopt a gate-approach** for enhancing existing processes and management of TA activities.

The “10-Boxes Model” – managing each element effectively is imperative for a successful turnaround

Source: T.A. Cook Consultants Turnaround Excellence Model

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A TA organization is the foundation for a refinery to ensure that milestones are delivered and communicated throughout the TA process

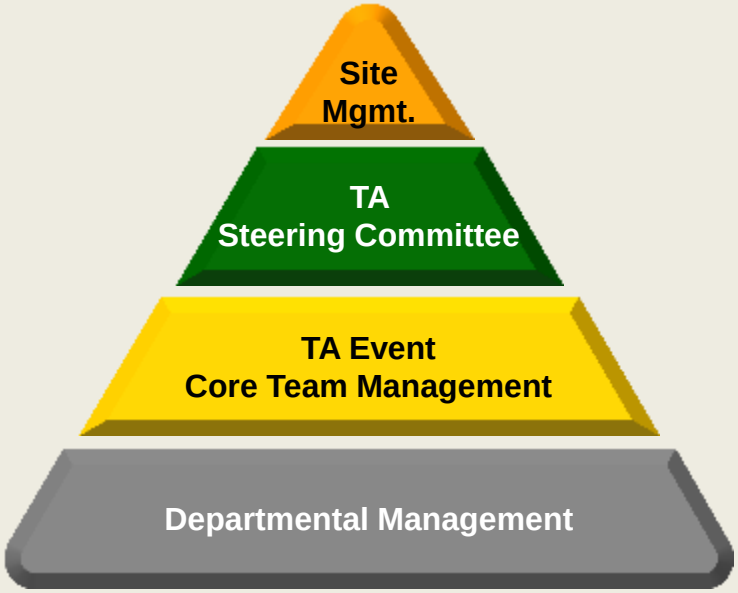
- A temporary TA team is established for the **Front-End-Loading** and the **Work Execution phases** that incorporates Project Management best practices
- **Resource requirements are drawn and levelled** as needed to achieve deliverables and milestones
- As a refinery approaches execution, the structure and **number of resources required can significantly increase**
- Most refineries do not have sufficient resources to perform a turnaround with their own staff and therefore need to involve a large number of contractors
- High overhead and indirect cost is associated with using contractors

Commonly found opportunities to strengthen TA organizations

- **Over-crewing** of TA organizations to attain milestones and/or objectives on schedule and budget
- Contractor organizations often do **NOT** meet good practice ratios for overhead and **span of control**
- **Roles and responsibilities** for certain positions are not clearly defined
- **Complex / ineffective communication** and reporting channels that entail too many interfaces

In order to implement effective best practice, TA organizations must entail the following criteria:

- Communication within the organization to follow a **top down/bottom up structure**
- **Clear line** to **communicate** and **escalate** subjects that matter
- Defined roles and responsibilities
- Application of **clear organization principles**
- Contracts meet requirements



Source: T.A. Cook Consultants Turnaround Excellence Training Model

In order to execute work effectively, the TA organization must ensure an adequate span-of-control

Proper span of control that promotes and enables active management

Contractors - Span of Control	Best Practice	Project Example
Foremen to Craft	1 : 8-12	1 : ~8-10
General Foremen to Foreman	1 : 4-6	1 : ~3
Area Supervisor to General Foremen	1 : 4-6	1 : ~3
Site Superintendent	1 : 8-10	1 : ~7
Direct vs. Indirect	20 : 80	30-35 : ~65-70
Internal (Execution)		
Execution Coordinator to GF/Supervisor	1 : 8-10	1 : ~11

Source: T.A. Cook Consultants 2015 Project Example of a TA Work Execution Organization Dashboard

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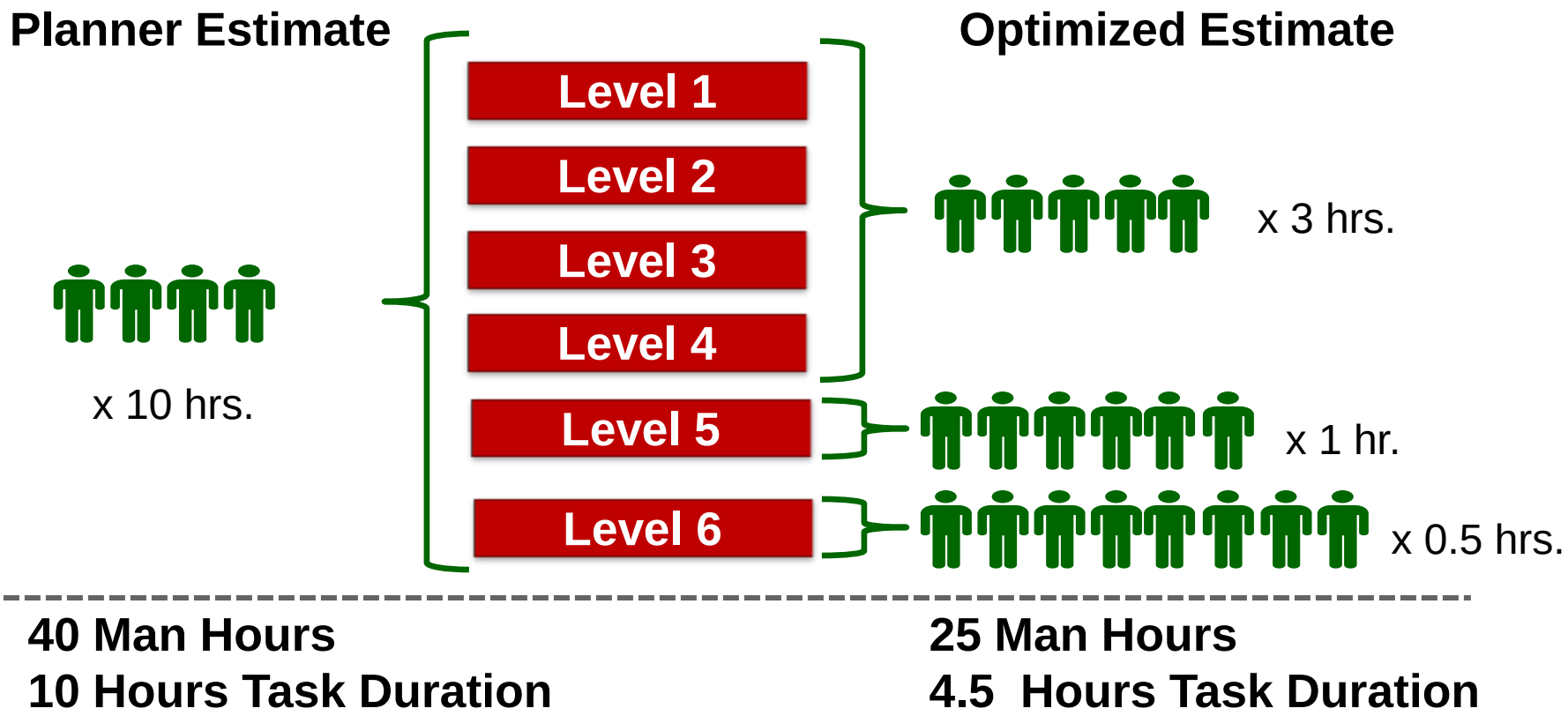
Planning & scheduling are generally considered the most important functions of the TA Front End Loading (FEL) process

- Historically, **successful turnarounds** have always been **well planned**
- But a well-planned turnaround does **not** necessarily **guarantee** that it will be **successful**
- Focus is typically towards tracking and **attaining planning milestones**
- Hidden **opportunities** are typically found in **estimating work** - often overlooked
- Work Packs often **lack** the required **level of quality and detail**

Planning estimates are often inflated & schedules are not sufficiently maintained ensuring timely updates

- Costs or durations for activities are based on previous turnarounds and/or shutdowns.
- Planners do not always walk down jobs to **challenge historic estimates**.
- Current **job plans accommodate additional time for contingencies**.
- Schedules are **not accurate** enough to properly **capture the developing situations** as they arise during work execution.

Example of opportunity within planning estimates



Source: T.A. Cook Consultants 2015 Project Example, erecting a 6 level scaffold

Implementing planning and scheduling best practice methodologies will ensure schedule accuracy and work execution adherence

- Ensure planners have the **required skill** sets and proper **planning processes** to efficiently **facilitate planning practices**.
- **Adjust the planning approach** to changing scopes & requirements.
- Establish a fully integrated schedule to include the following criteria:
  - Standardized schedule format
  - **Integrated schedule** that **includes all activities** (Operations, CapEx, Inspection, SD/SU, supportive activities, permits, …)
  - **Communicate** with all **stakeholders** from the beginning
  - Can be easily **updated** and **maintained**
  - **Progress** on activities can be quantifiably **measured**.

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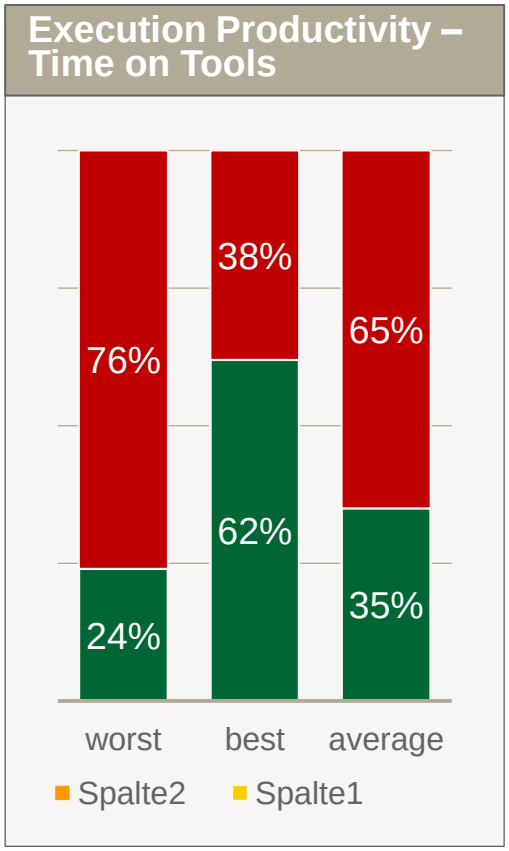
Poor work execution of turn-arounds, meaning poor schedule adherence and missing targets, can have a significant financial impact

- The primary objective of the work execution is to carry out **work safely, efficiently and as scheduled**
- **Performance metrics** such as earned vs. burned hours can be **misleading**
- Attention: **Productivity might be lower than reported** and time on tools is considerably less than industry best practices

Commonly found opportunities during the turn-around work execution phase

- **Low craft productivity** and **time-on-tools**: waiting, missing men or material, lack of coordination
- Poor **schedule adherence**
- Inaccurate **progression reporting**
- Misleading performance metrics such as earned vs. burned hours
- Poor **coordination** of support activities
- Inadequate **mitigation of delays**



Source: T.A. Cook DILO Studies

Active involvement and supervision of contractors does promote the drive for increased performance

- Clear and defined **roles and responsibilities** for **internal coordinators**
- Further **on-boarding and communication plans for contractors** incl.:
  - HSE plan
  - TA-Management expectations
  - Schedule adherence and progress reporting
  - KPI reporting
  - Issuing of permits
  - Reporting of delays
  - Accurate and consistent schedule updates
- **Training & coaching** to enforce **proactive performance and delay management** in the field

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TA Risk Assessments should be conducted at least once during each of the following TA phases

Source: T.A. Cook Consultants Project Data and Maindex® Database 2015

Risk Management during Front-End Loading FEL and work execution is paramount, and is an integral part of the TA process

- In most organizations, the preparation for a turnaround relies heavily on **using resources from other departments**
- The process to coordinate these resources is **complex**
- It is paramount for a refinery to treat a **turn-around as a site-wide event** instead of a TA team initiative.

Checklist – Top 38 Risks

Review: Peer Review

Risk Calculator

#	Risky points	Risk Factor	High - 5	Medium High - 4
1.1	Changing/Non-aligned TA project objectives (Top)	1	- No freeze of the objectives or changing - No clear objectives - No consistency and aligment among the team	- Agreed among the management - Not communicated to the team
1.1	Lessons learned from last TA / TA Review not integrated		- Lessons learned from last TA not done at all - No review system is in place - No best practices and improvement opportunities considered	- Lessons learned are done - No improvement projects or best practices are derived - No review process is integrated.
1.1	Has the TA been delayed, postponed or deferred?		- The timeframe is still unsafe - Alternative actions have to be done to extend legal requirements	- The date of TA has been deferred to next year - Alternative actions have to be done to extend legal requirements
1.2	Cost higher than expected (wrong estimation/market conditions)		- The costs are not reviewed at all. - No clear scope when costs were estimated	- Reviewed on irregular basis. - No clear scope when costs were estimated
1.2	CI Project closure delayed for TA (engineering status)		- The duration of the TA could extend significantly - The duration of the CI project is still unclear. - Risky points were identified - No actions to mitigate possible risks	- The engineering status is delayed significantly - Risky points were identified - Actions to mitigate possible risks are planned
1.4	Raised accidents in the past		High accidents rate (reportable), high incident rate.	Median incident rate, median reportable accident rate.
1.4	Special weather conditions considered (containment work)		- Not considered at all - Not integrated in the HSE strategy.	- Considered - Not integrated to the HSE strategy - Not documented to support any measures.
1.4	Quality problems (e.g. leaks)		- Happens very often - Caused rework - Caused demages - Caused accidents	- Happens often - Caused rework - Caused demages
1.4	Local Health & safety regulations considered		- Not considered - Difficulties already occured with impact on cost, duration etc. - Local stakeholder are not involved	- Not considered - Difficulties could occure with impact on cost, duration etc. - Local stakeholder are not involved
1.5	Change in contracting strategy or main contractor		- Major changes - Problems with capability of the main contractor - Never collaborated with the contractor - Probably high impact on quality, HSE etc.	- Changes in strategy or main contractor - Never collaborated with the contractor but Contractor has excellent references
1.5	Any difficulties in finding skilled crafts		- A relevant number of workers will not be available - Impact on duration or time frame is foreseeable - Never collaborated with the contractor	- A small number of craftsmen could not be available - Can be compensated with resource leveling - Never collaborated with the contractor but Contractor has excellent references
2.2	Scope management not in place		- No evidence of a scope management process	- No commitment to scope management process
2.2	Scope freeze not in timeline		The scope has never been frozen.	The scope has been frozen with long term delay
2.2	AWR process in place		- No evidence of a usage of an consistent AWR process - A lot of additional work requests	- An AWR is defined but not used consistently - A lot of additional work requests
2.3	Responsibilities for Capital projects integration clearly defined		Roles and responsibilities have not been defined.	Roles and responsibilities have been defined but not communicated to the team.
2.3	Are CI working packages completed nine months prior to TA start date		CI working packages are not completed and the integration structure is not defined.	CI working packages completion is running late and the integration structure is poorly defined.
2.3	Modifications involve new process technologies		Modifications do involve new process technologies that are not documented or communicated.	Modifications do involve new process technologies that are defined and documented but not communicated to the team.
3.1	Delay in work package preparation		- The preparation of the work packages is delayed significantly. - The TA begins within 1 month	- The preparation of the work packages is delayed significantly - The TA begins within 3 month
3.1	Too much additional scope (after freeze)		- A lot of additional work - Cost estimation has to be raised significantly - A "final" scope freeze is not foreseeable	- Some additional work - Cost estimation has to be raised - A "final" scope freeze should be reached soon
3.3	Different IT tools applied		- Not defined - Everyone uses the IT-tool that suits to it.	- IT-tool is defined - Not trained - Bad utilization
3.3	Non integrated Infrastructure planning		The infrastructure planning is not defined, leading to an organization that is not optimal during the TA	The infrastructure planning is poorly defined and not integrated in the planning process.
3.4	Long lead equipment, spare parts, not defined and ordered in time		- Material management plan is not defined. - Essential equipment will not be delivered on time.	- Material management plan is not defined. - Essential equipment on time delivery is unsafe
3.4	Material & Contractors prices increasing (cost risk)		- TA's costs increased significantly - No substitute available/possible	- TA's costs increased significantly - Substitute partly available/possible
3.4	Financial problems on contractor's side		Contractor goes bankrupt and is not able to fulfill the planned service anymore.	Contractors has a relative level of risk to go bankrupt.
3.5	Time estimates for the work to optimistic		- Estimated time is too short - Work is on the critical path - TA's timeframe is increased significantly	- Estimated time is too short, partly compensated by contingency - Work is on the critical path - TA's timeframe is increased
3.5	Insufficient quality of work package preparation		Heavy impact on: - available crafts - scheduling - expediting	Impact on: - available crafts - scheduling - expediting
4.1	Lack of central functions (scheduler, planner, discipline specialist)		- Central functions are not defined - Functions are not done consistently - No ownership for central functions	- Central functions are poorly defined - Functions are not centralized - No ownership for central functions
4.1	Lack of management skills/competencies		- No evidence for a managing structure - No ownership of the management function - No alignment between management and team	- Managing structure is poorly defined - Poor ownership of the management function - No alignment between management and team
4.1	Lack of clarity over roles & responsibilities		- Roles and responsibilities are not defined - No ownership for responsibilities - The distribution of responsibilities is impractical	- Roles and responsibilities poorly defined - Low ownership for responsibilities - The distribution of responsibilities is mostly impractical
4.1	Lack of operational support (planning, safety watchers, SD/SU)		Resources are not estimated correctly, leading to a lack of operational support.	Resources are defined and estimated, but do not meet the level of skills and competencies to meet the requirements.
4.1	Risk of decommissioning delays		No preparation of measures or actions to be taken in case of decommissioning delays.	Measures and actions defined in case of decommissioning delays but not communicated to the team.
4.1	Many jobs related to critical ressources (critical lifts, line breaking ...)	3	- Many jobs are related to critcal ressources - Ressources are not experienced and trained	- Many jobs are related to critcal ressources - Ressources are trained but lack of experience
4.1	Low availability of specific equipment (heavy crane, etc.)		- The availibility of specific equipment is unsafe - No substitute available	- The availibility of specific equipment is unsafe - Substitute is available - No experience with the substitute
4.2	Major changes in cleaning procedures / technologies		- Changes have a significant impact on the working process - Procedures are not documented and trained	- Changes have an impact on the working process - Procedures are documented
4.3	Any new Permit handling system / model	5	- New permit system - Never collaborated with the contractor - Procedures are not documented nor trained - Permissions are not prepared	- New permit system - Procedures are documented and trained - Permissions are not prepared
4.4	Milestones delayed, postponed or deferred		- Milestones are delayed significantly - Delay can not be recovered - High impact on TA is foreseeable (costs, time etc)	- Milestones are delayed - Delay is hard to recover - Impact on TA (costs, time etc)
4.5	First time jobs - unfamiliar tasks / new procedures		- New tasks / jobs - Never collaborated with the contractor - Procedures are not documented and trained	- New tasks / jobs - Never collaborated with the contractor but contractor has excellent references - Procedures are documented

Risk Factor: 3,00 Medium

Source: T.A. Cook Excellence Model

Risks actively managed often turn out to be opportunities to make a turn-around more efficient

- The **Risk Management process** is not or not well defined
- **Roles and responsibilities** of involved departments and personnel are **unclear**
- Lack of **adherence** to the **risk process**
- Risks are **not actively managed**
- Low consensus and common understanding of the Top 5 risks
- Frequency of **risk management meetings** is insufficient

Source: T.A. Cook Excellence Model

Best practice risk management consists of four stages

Process Step	Content	Tool/Format
Identification	Continuous Process • Identifying potential risks	Workshops 
Evaluation	Evaluation Steps • Risk Probability (0-10%, 10-40% etc. • Risk consequence (significant, severe etc. against various dimensions (i.e. business impact)	Risk Matrix 
Mitigation	Mitigation Options • Avoidance (do not do the work) • Reduction • Transfer (to another party) • Retention (accept risk, budget)	Workshops 
Monitor/ Implement	Track • Progress of mitigation implementation • Changes in the risk level due to changed circumstances	TA Risk Register 

Source: T.A. Cook Consultants Turnaround Risk Management Model

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THANK YOU – QUESTIONS?