

Project (time) Control for an EPC project

Introduction

As part of the tasks and responsibilities of project control, the aspect of (time) control during the course of a project can be applied in many ways.

The main elements which can influence the aspect (time) control during an **Engineering, Procurement & Construction project (EPC project)** are described in this document. Each of these elements contribute significantly to the effective control of a project.

Three phases of project control are identified during an EPC project. Within these phases, a number of subjects are described which have a relation with the aspect (time) control.

1: Preparation phase

- 1.1 Project Execution Plan
- 1.2 Risk management & analysis
- 1.3 Project network planning
- 1.4 Control tools for the project phases

2: Control and reporting phase

- 2.1 Reliable (project) information
- 2.2 Timely availability of information
- 2.3 Consistent availability of information
- 2.4 Project control as "bottleneck"
- 2.5 Changing circumstances
- 2.6 Competence of project members
- 2.7 Role of the project control employee

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- 3.1 "As built" project control information
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1: Preparation phase

1.1 Project Execution Plan

The drawing up of a Project Execution Plan (PEP) is one of the first steps in the preparation for the execution of an EPC project. The main components of this plan, relating to project control and forming the basis of a effective approach towards project control are:

- a) The definition of the project goals.
- b) The definition of various project structures, allowing for organisation and control at pre-defined levels of detail:
 - Work Breakdown Structure (WBS)
 - Organisation Breakdown Structure (OBS)
 - Cost Breakdown Structure (CBS)
- c) The definition of the scope of work and respective budgets. The “boundaries” of the project are defined at a high level and form the basis for the setup and maintenance of different project control systems (ref. 1.4 Control tools for the project phases). By “freezing” the project scope during the definition phase of the project, a clear basis for change control and variation control is achieved.
- d) The establishment of a management schedule, in which the project goals, the various structures and the project scope are translated into. This schedule identifies at a high level the major activity timeframes, budgets and key milestones, as well as the critical path of the project. It identifies the project execution strategy!

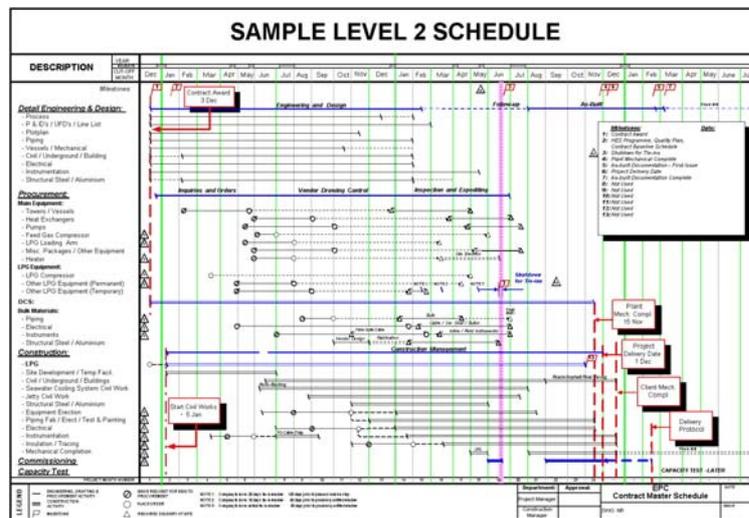


Figure 1: Management schedule

- e) The establishment of a cost plan based on the management schedule and the defined budgets. In this manner the financing of the project costs can be determined and visualised.
- f) The definition of project control requirements, procedures, audit schedules and schedule/cost/ risk reviews for each phase of the project.

The abovementioned project control elements are set-up and incorporated into the PEP, in conjunction with the company and project management strategies.

1: Preparation phase (continued)

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1.2 Risk Management & Analysis

Risk Management forms an integral part in the decision making mechanism of Project Management. Every part of the Project Management team is involved in definition and follow-up of Risk Management, including project controls!

One of the tasks of project controls is to perform quantitative risk analyses in support of the management of project risks. This is achieved by applying time related risk constraints to the schedule and performing "what if" analyses.

Risk Management and control is performed on a periodic basis throughout all phases of the project. Project risks are defined in the definition phase and form the basis of setting the project execution strategy and can also be found in the project execution plan. Each of these risks is entered into a "Risk Database", which generates detailed and summary risk reports.

All risks are categorised into groups and are related to types of risk. After defining and categorising all the risks, the effect of each risk is identified. These effects can be categorised into three groups:

- Schedule
- Financial
- Scope

Corrective measures to eliminate or reduce any one of these effects are defined in the Risk Database and appropriate action is taken by the responsible person.

During each phase of the project, these risks are monitored periodically and, if applicable, additional risks are identified during risk management reviews and incorporated in the Risk Database.

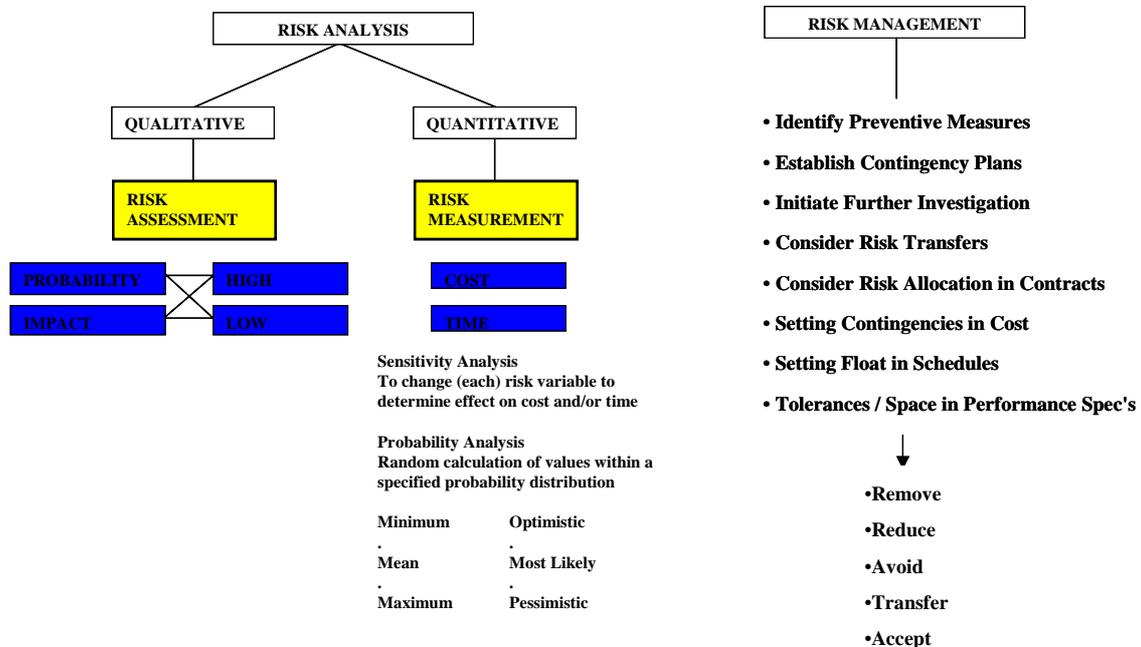


Figure 2: Risk Analysis & Management overview

1: Preparation phase (continued)

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1.3 Project network planning

In addition to the abovementioned preparations, a project network planning is established. Two of the most important reasons to create a planning for an EPC project are:

- 1) The visualisation of all internal as well as external steps in the various work processes that take place during the project.
- 2) Obtaining commitment throughout the project organisation for the execution of the project according the agreed planning.

Through the planning of work processes, the transition in responsibility from one step in the process to the next becomes transparent. Subsequently, all external dependencies or interfaces that have a relationship with the project are visualised.

With this planning the internal activities of the project can be controlled in time, after evaluation and incorporation of the status. It is also possible to identify whether external activities are influencing the execution of the project. This way, the influences can be visualised the moment they occur.

There are additional benefits in preparing a network planning such as; critical paths, the amount of float and the distribution of resources (labour, material and cost). Be aware that the preparation of a network planning for large and complex projects can be very time consuming!

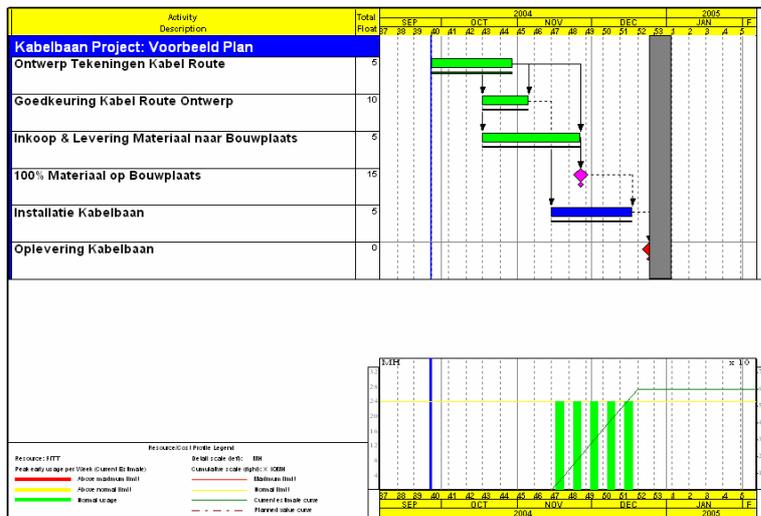


Figure 3: Project network planning

1: Preparation phase (continued)

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1.4 Control tools for the project phases

In a EPC project the following project phases can be identified:

- a) Engineering phase
- b) Procurement phase
- c) Construction phase

To control each project phase in more detail, the following control methods can be set-up:

a) Engineering phase

During this phase, the progress of the engineering scope can be monitored by document. Efficiency can be monitored by man-hour expenditure in relation to the progress of deliverables. This allows for effective monitoring and reporting of the available information generated during the engineering phase of the project. By means of a "roll-up" of data through the pre-defined structures, detailed information is summarized to a management level with relative ease. The comparison of the obtained status with the project network schedule shows where advances or delays to the project occur.

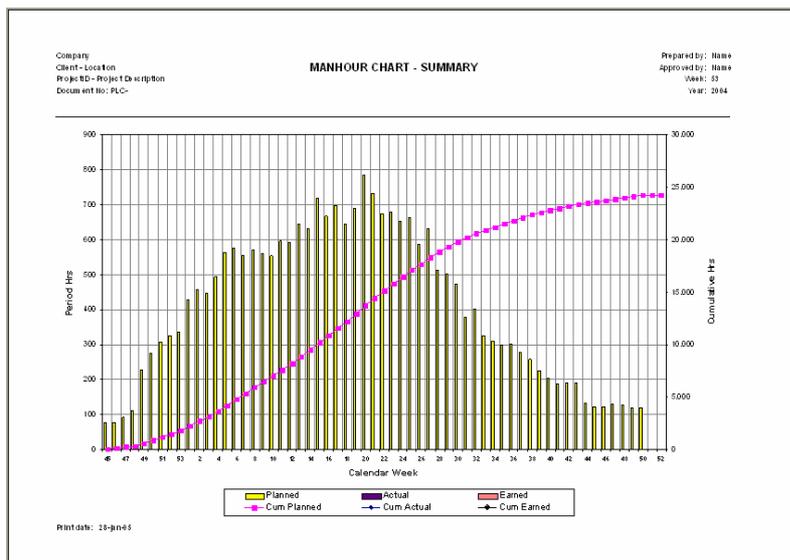


Figure 4: Engineering man-hour & progress curve

1: Preparation phase (continued)

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During this phase of project control, the main focus is to achieve effective time control of the project.

One of the main tasks of project control is the obtaining and processing of planning, progress and financial information during the engineering, procurement and construction phases of the project as defined in the preparation phase.

Making use of various control tools will contribute to an effective and efficient gathering of project status information. Based on this information, a planning and cost analysis is performed, resulting in a comparison of the current status with the project strategy. Corrective actions and possible variations to the project strategy are reported to the project management for evaluation and action.

However, project control is more than just generating, analysing and reporting of physical progress on the project. Through their position as project control employee, a total overview of the project can be obtained and in this role they can contribute greatly to the success of the project.

2.1 Reliable (project) information

As mentioned earlier, the obtaining and processing of project status information, making use of pre-defined systems, is a task of project control. However, the available information must be correct and complete. The right decision can only be made with reliable information!

Comparable signals > Reliable information

The project control employee collects and compares information from different sources to validate the reliability of the information received. This reduces the chance of making use of the wrong information. This validation process can take up a lot of time (especially in the initial phase), but it can prevent decision making based on incorrect information.

- Detailed and registered project information
 - o Planning
 - o Procurement overview
 - o Task list
 - o Document list
 - o Item list
 - o Action list
 - o Timesheets

- Information from a second source (internal or external)
 - o Reports from the contractor or fabricator
 - o Information from the client
 - o Feedback from line management
 - o Audits
 - o Questionnaire
 - o News bulletins

- Information through feedback with the responsible person
 - o Discussion
 - o Interview
 - o Meeting

2: Control and reporting phase (continued)

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2.2 Timely availability of information

The timely receipt of information is just as important for effective project management as reliable information. If the delivered information is not up to date, or is not received in time for the meeting in which it immediately can be used, then project management loses effectiveness.

How often does it happen that important information is presented during an internal project meeting, which does not allow for sufficient evaluation and timely decision making? Either a hurried decision during the meeting turns out to be incorrect, or actions and responsibilities can only be delegated during the next meeting, which might be too late...

The earlier reliable information is available, the more time remains to make a valued evaluation and the more alternatives are left to choose from. However, this can prove to be a disadvantage, as the available time is used to divert from the project goals, or decisions on the project are unnecessarily delayed due to the absence of time pressure! It is therefore important to decide what should be done with the available project time on a continuous basis.

2.3 Consistent availability of information

Not only the availability of reliable information at the right moment is important. Also the consistent receipt and registration of the status of scope of work is required for an effective control of the project. The weekly or monthly registration of progress information will contribute to the establishment of a concise overview of the development of the achieved progress on the project. Trends can be identified and corrective action can be taken at the earliest moment.

2.4 Project Control as “bottleneck”

Making predefined systems and structures available which are utilized by all project team members contributes to an organised receipt and expedient processing of project status information. This will enable the project control employee to generate management information in a short period of time, which can be made available before the start of e.g. an important progress meeting. This will increase the effectiveness of the project manager in the meeting, as well as the meeting itself.

Information- and progress systems:

Project team members (partly) responsible:

- Document control system
- Time registration system
- Procurement system
- Punchlist system
- Central actionlist

Project control employee responsible:

- Engineering progress system
- Procurement progress system
- Construction progress system

2: Control and reporting phase (continued)

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2.4 Project Control as “bottleneck” (continued)

By spreading the responsibility in the supply of project information, by using a variety of information systems, it is possible to avoid that project control becomes a bottleneck in the timely supply of analysed information to project management. The gathering and processing of project information is not a full time job for the project control employee, but it becomes possible to fulfil the reporting requirements after a minimal processing period and allowing time for a thorough review and analysis.

It is imperative that project control is the central point of information obtainment and supply on the project, although this information is generated by a variety of project team members.



← **project control**

2.5 Changing circumstances

During the course of the project, changing circumstances will occur that have an effect on the control of the project.

Internal <> External
Direct <> Indirect
Foreseen <> Unforeseen
High impact <> Low impact

As a project is always executed by people, these changing circumstances can happen in any situation, at any time during the course of the project. For example; the internal shortage of employees, unforeseen absence of personnel through illness or accident, seasonal influences, culture differences, the ever changing market, interests of third parties, changes in laws etc.

All changes that have an impact on the project execution strategy will have to be valued and treated based on their effects.

2.6 Competence of project team members

Another aspect that determines the level of control on a project is the competence of the project team members. Of course the expression “the right man for the job” is valid when it comes to the level of knowledge and expertise that is required. However, the level of input, motivation, commitment and positive approach of an employee also plays an important role. This is valid for everyone contributing to the project, through all levels of the organisation.

2: Control and reporting phase (continued)

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2.7 Role of the project control employee

As an integral part of the project organisation, the project control employee plays an important role in the effective control of a project.

“Plan the Work > Work the Plan”

As part of the preparation phase, buy-in to the project planning is obtained from each of the responsible project team members. If the time goals of the project, as set in the project planning, continue to be supported throughout the course of the project, the plan can be maintained without further modifications. This could be because enough flexibility (float) has been built into the planning.

The project control employee plays an important role in the maintenance of the project planning, which can be very time consuming. Although the responsibility for the execution of the work that is set-out in the planning lies with the other project team members, the project control employee is “the owner” of the planning product. It is their job to “sell” and “promote” the planning.

“Better to follow an imperfect plan consistently and successfully, than to have a perfect plan fail through constant modification and improvisation”

“Effective control”

What is important or critical? What requires the most attention? Where is detailed project control required? These questions can be answered at the beginning of a project by determining the risks on the project. However, as soon as the project kicks off, changing circumstances will occur that were not foreseen. The project control employee should have the flexibility to fulfil the project control tasks in such a way that they are result orientated. This means that based on the requirements on the project it should be possible to divert from the predefined structure, in order to focus on that what is important to achieve the project goals. Do not waste time generating reports that are not (in)directly contributing to the success of the project!

“Communication Specialist”

The communication skills of the project control employee can have an influence on the effectiveness of the planning. As mentioned above, the plan must be supported by all responsible parties. The project control employee contributes to this through effective communication with the responsible team members.

Internal communication

Using different communication forms to encourage team members to work together and execute planned activities over and above their formal responsibilities. The motivating, convincing and inspiring of team members forms the key to success in effective control of a project: “Teambuilding”!

External communication

Communication with external parties *directly* involved with the project, such as clients, partners, suppliers, contractors and other contractual agencies forms an integral part of the responsibilities of project control.

Communication related to the status of the project with external parties *indirectly* involved in the project, such as line management, government and other concerned parties, can also be a part of the responsibilities of project control.

2: Control and reporting phase (continued)

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2.7 Role of the project control employee (continued)

“in comparison to the project manager”

The combination of project manager, project control employee and project is always unique. The role of the project control employee, but also the effectiveness, is highly dependant on the role of the project manager. They can support each other in the execution of various project control activities on the project.

“Trendsetter”

Through quantity analysis of the work process steps within the project, it is possible for the project control employee to identify trends at a relatively early stage, which will enable project management to take corrective actions. The following of quantity trends can supply useful information in addition to the analysis of the project planning and the periodic progress of activities.

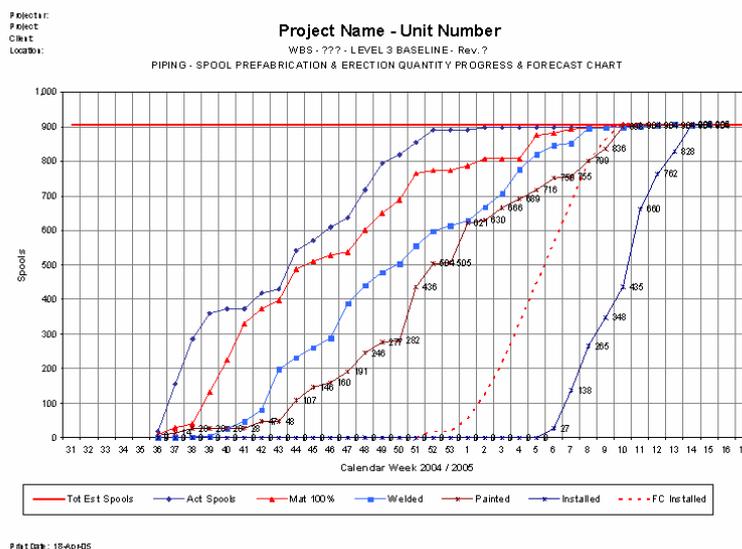


Figure 9: Production trend overview

3: Evaluation phase

Project (time) Control for an EPC project

Part of the close out phase of the project is the delivery of "as built" planning and cost information, lessons learned and improvement proposals to management for implementation on future projects.

3.1 "As built" project control information

Through the consistent obtainment and inventory of project progress information a vast amount of data is available for the evaluation of achieved results during the course of the project.

This information can be presented in a variety of way's to suit the requirements, visualising specific situations that have taken place during the project.

The actual achieved start and end dates of activities in the network planning can be mirrored against the originally planned dates, or other important moments during the project. A comparison in this manner may clarify when certain delays started, what may have caused these delays and how much impact they have had on other activities on the project.

This has an added value for the analysis and identification of internal improvement areas, as well as the supply of backup for any possible disputes with third parties.

3.2 Project close out reporting

Based on the abovementioned presentation and analysis of actualised project information, lessons learned can be formulated for future projects. These can become part of the project close out report, together with all statistical project control information.

Together with all relevant technical project information, this forms the basis for the project archive.

The availability of informative data from historical projects and the clear formulation of improvement areas for future projects will in turn contribute to the effective control of new projects!