

**Hassan M. Ahmad AL-Kandari**  
**Project Mgmt. Specialist ( S&E )**  
**KUWAIT OIL COMPANY (KOC)**

## **S-Curve analysis – Case Study**

### **Abstract**

Presentation of a case-study regarding the analysis of S-Curve of a life project draws a concrete projection of a powerful tool in project management in all aspects (planning and tracing and monitoring a project).

The analysis covers “ construction phase “ at different stages and steps of the original planning and the revised planning including the turning points along the S-Curve progress path in meeting the project’s objectives and in adding new values to the scope. These turning points along the S-Curve path reflects the project management decision making as well as adding values to the scope in term of adjustment orders and to push the process further to the final destination “ move-in mobilization and handing over the project “ to the users. The core question, Is it possible to intervene in a way to push the on going process and bring the deviation back to the S-Curve path after fulfillment of the shortage in planning sources and time scheduling?

### **Introduction**

S-Curve Analysis provides sound evaluation and depicts a clear picture of a project process and its development.

Projects are considered living-system; this means the stages of process has a natural cycle with dynamically changing along the path of the project life cycle. That makes the project management’s potentiality high and challenging to meet all milestones objectives and the planned requirements successfully. Also, S-Curve provides a practical ground for PM decisions and actions. The frame-work of the S-Curve from the start-up (birth) and growth along the path development to the completion (maturation stage), then to have the decline stage, thus all projects experience constant changes during the life cycle process.

The S-Curve is a Model for observing a project process through known phases (conceptual, design, contractual, construction, utilization and operation, modification and obsolescence for getting red-off and recycling finally) and to monitor stages of each phase.

The interpolation of S-Curve analysis gives the indication, as reading the X-Ray of a patient, of historical development and the deviation from the established previously planned.

These deviations draw the actual progress (see figure.5 ).

S-Curve as tool presents resources relationships in term of different variables which are scaled as percentages (% costs) in relation to the time variable, this relationships draw the future path to meet the objectives and the final target goal, also S-Curve helps the communication management (reporting, meetings, coordination, directives, and the adjustments orders along the path) and the teams participations in decision making.

### **Nature of the S-Curve**

The general appearance of an S-Curve is flatter at the beginning and end and steeper in the middle. The S-Curve is a logistic curve describes how the work's progresses and changes diffuse through certain path. The S-Curve's shape shows an initial period of slow change the accelerated and rapid change in the middle, and then followed by slowing down as the growth approached to the completion stage.

Also, in construction phase the S-Curve illustrates the starting site mobilization and preparation of technical documentations, workshop drawings, getting approvals of parties beside on-going some activities such as earth work preparation and surveying works, etc. Where at the growth stage the exponential materialization of structures and the facilities and the support services of a project's components takes place.

Overall we can say that S-Curve gives a comprehensive picture of the project's progress, and at the same time is a flexible framework to manage a project successfully and understand the causes and effects of all involved variables and the resources in relation to the time scale.

Thus the S-Curve graphically traces and allows a quick and timely identification of the problems that might negatively affects the progress of a project through periodical reports and highlighting the actual against the planned activities and answers crucial questions:

- Will the project be completed as scheduled?
- What are the expected dates of completion of different activities as at present rate?
- How many costs or the payments (invoices) are incurred on particular date?

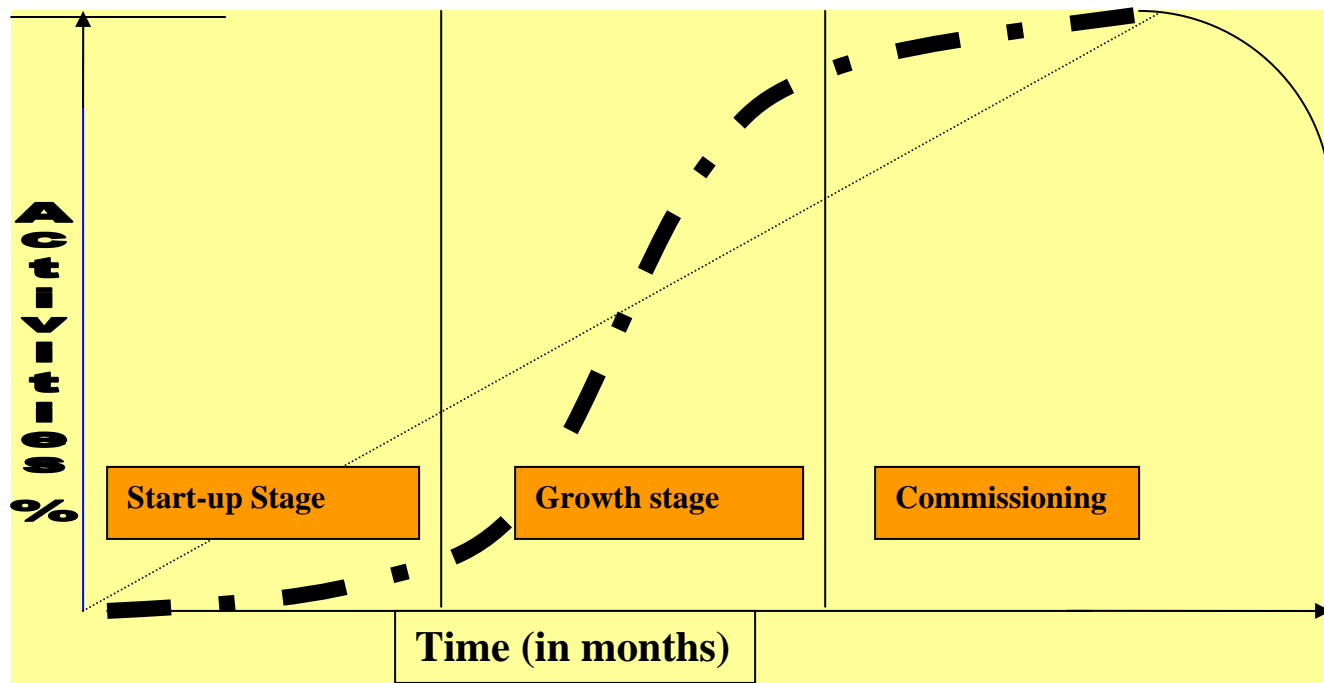
### **Background Case-study Project**

The following is the brief components of the projects under the study as an example to our case-study of S-Curve analysis:

The Project site is located in the Burgan Oil Field behind the Burgan Fire Station. The Plot area is approximately 180m x 200 m

**S-Curve – at the construction phase (Model):**

S-Curve as PM tool at the construction phase consists of cumulative other quantitative variables (Activities Packages) plotted against time variable. The base for S-Curve is the work break down structure (WBS) which is breakdown of the work into systematic and logical components packages, these components are reflected through activities with dates, costs, and weighting percentage on the vertical axis.



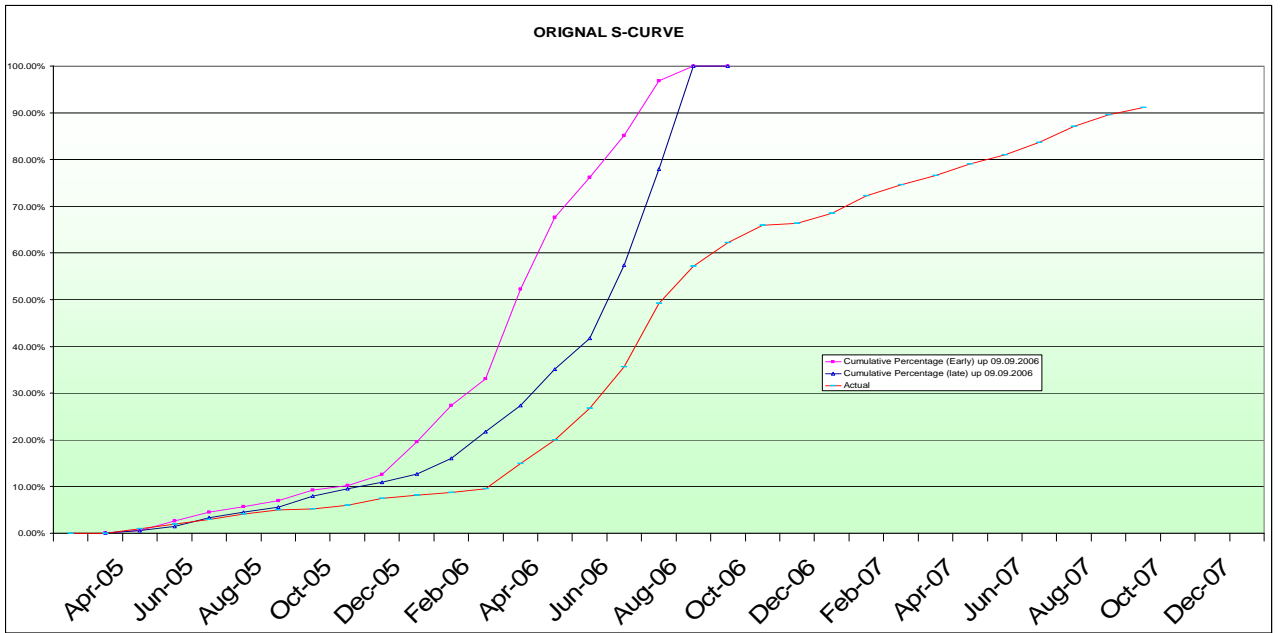
**Figure- 1**

**Baseline S-Curve Model (see figure – 1):**

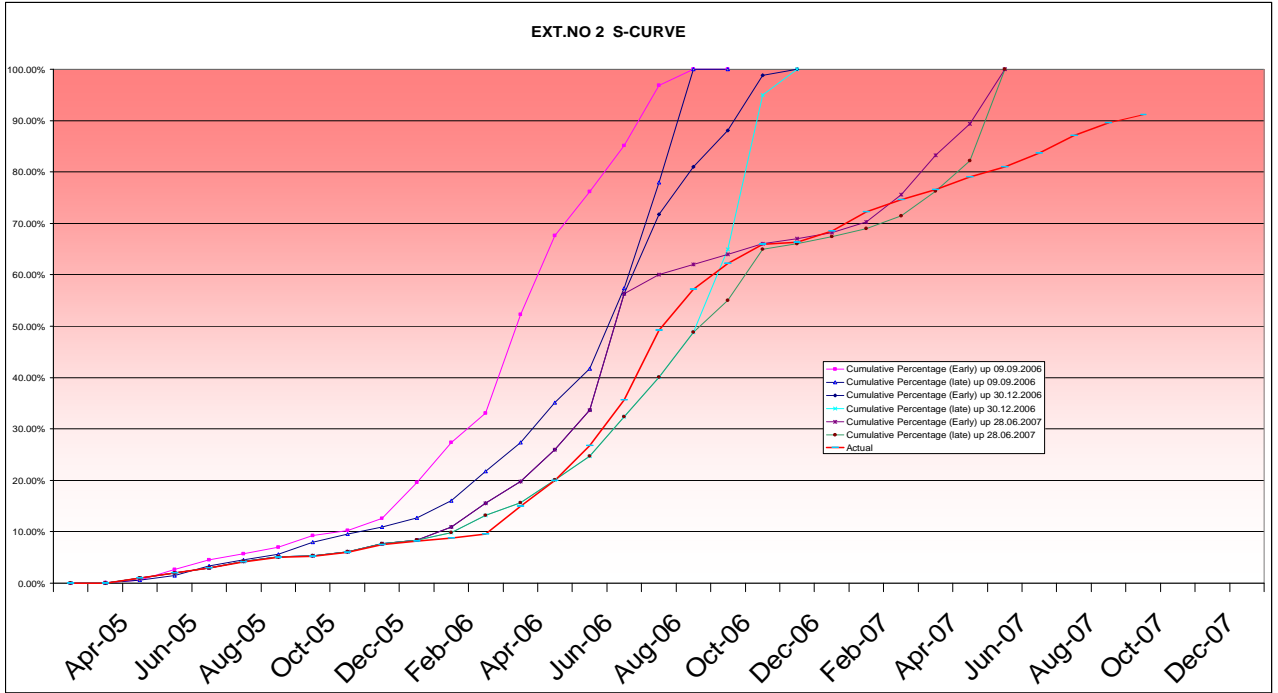
The above S-Curve in general shows cumulative costs expended over time for the duration of the project, and used to assist in calculation of the project’s cash flow. Prior to project commencement. A schedule is outlining the proposed allocation of resources and timing of tasks necessary to complete the project within a set of time-frame and budget. Thus the original schedule is referred to as baseline S-Curve. This S-Curve reflects the planned progress of a project.

**Actual S-Curves case-study, (Figure- 2, Figure-3, Figure-4)**

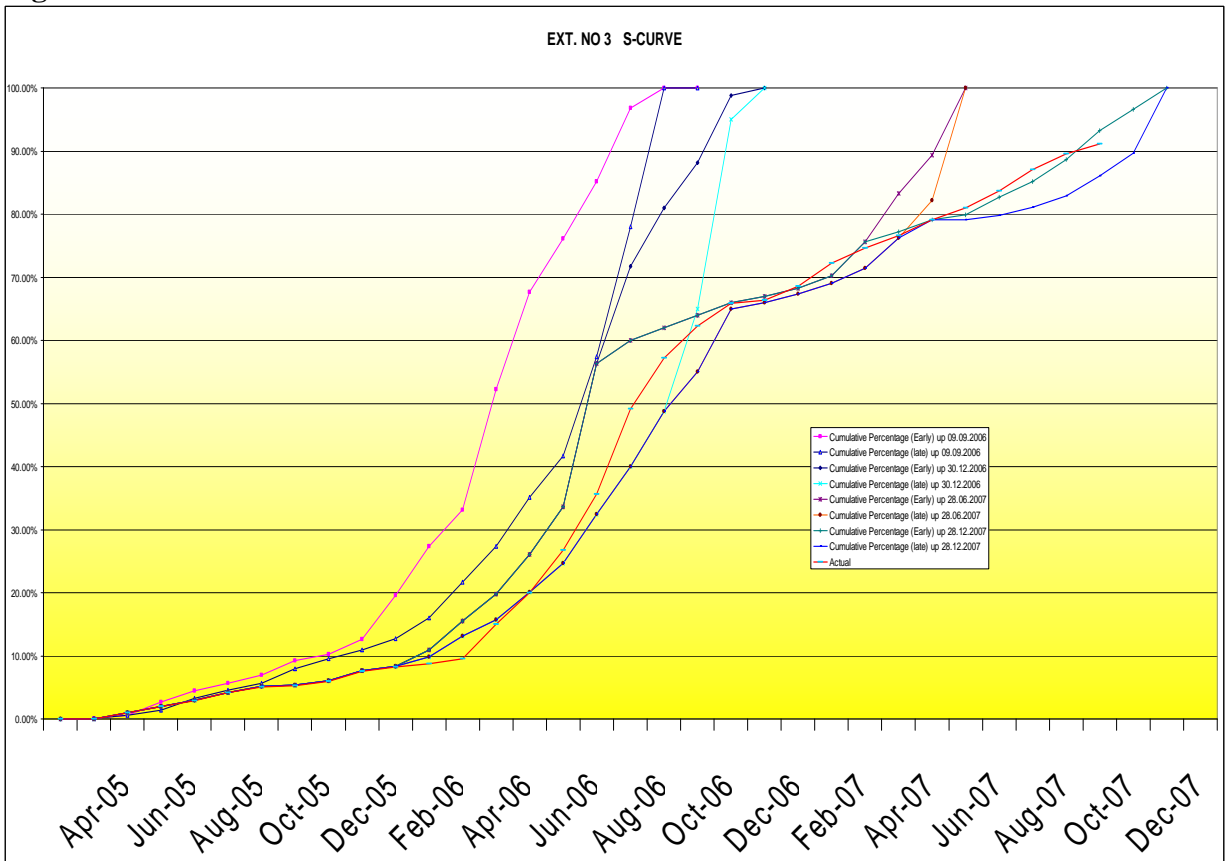
The following planned S-Curves are updated on a regular basis (monthly) throughout the duration of the project. These updates include the revision of percentage completed for each task to-date. The planned and the revised planned S-Curves are generated which reflect by presenting on-going S-Curve as an actual progress of the project to-date, and is compared with baseline to determine How the project has been progressed.



**Figure- 2**



**Figure-3**



**Figure-4**

## **Analysis:**

The above S-Curves 's figures ( 2,3,4 ) illustrate the changes and the shortfalls in the construction process and highlight the project development and help us to understand a practical construction management to push forward the project path to the final commissioning stage, that means to bring the S-curve path to or near the model S-Curve figure-1.

This study adds values to PM Knowledge as lesson learned and how to optimize solutions for typical projects in the future and reinforce the knowledge management system within the organization.

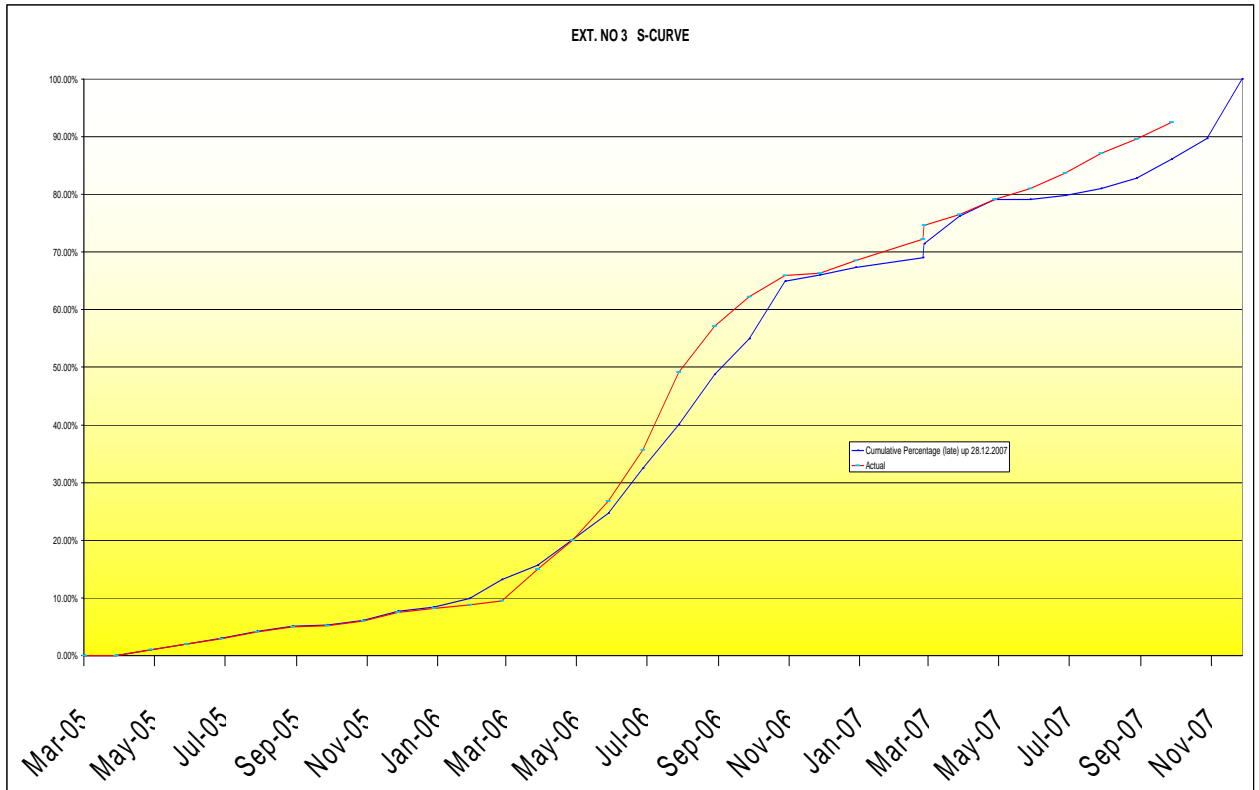
It is clear that original S-Curve in figure (2,) is far behind the model S-Curve due to some causes which will be highlighted by this case-study. The Stat-up stage of the S-Curve shows very flat covers more than 60% of the original contract period. Next, the original growth S-Curve stage appears very high steeped, that don't leave any space for commissioning stage at all.

That's dictated to modify the process and introduce a turning point by adding an adjustment order in term of scope (additional offices area) and 3month time extension to smooth the work process, as shown in figure (3), where is the turning point along the work progress directs to the next step towards modifying a situation by proposing a second adjustment order with time extension of 6month more to the contract duration.

By the second adjustment order the S-Curve Growth Stage shaped to have some characteristic of the S-Curve Model, but it's clear that still it needs more span to come to a turning point for the next completion stage (commissioning stage). Even though the 2<sup>nd</sup> adjustment order gave some breath to coach-up an increase in the level of performance, but still this growth behind the picture of the S-Curve Model, which forced the PM team to fight for an additional 3<sup>rd</sup> adjustment order of 6 months in term of time, to uplift the growth part of the S-Curve's work process further in a steeped way to meet the commissioning stage and bring the project to its final completion "handing –over moment".

## **Analysis and findings:**

In the following S-Curve (figure-5) represents the summary of the actual S-Curve for the whole construction stage duration (original contractual duration and the additional time variation durations).



**Figure-5**

This figure-5, the actual S-curve has been projected as accumulated data from the monthly progress report. Also, the report depicts the following brief of the major events as progress status of this case-study's project.

- Commencement date: 19 March 2006.
- Contractual Completion Date: 9 Sep. 2006, with 60% actual progress.
- 1<sup>st</sup> Revised completion date is Dec. 2006, with 70% actual progress (Time extension 3 months).
- 2<sup>nd</sup> Revision completion date: 28Jun. 2007, with 80% actual progress (Time extension 6 months).
- 3<sup>rd</sup> Revision completion date: 28Dec.2007, with 100% planned progress ( Time extension 6 months ).

**Findings in term of time-frame based on the above projected actual S-Curve and the status reports:**

To answer this question we introduce the following interpolation tabulation of time duration parentages needed to complete the project and to bring the shape of the actual S-Curve to the natural model S-Curve, which represents the logical progress of a project. Thus, the analyzed actual S-Curve duration after variations is .....

The following table is construction's time interpolation after the variations in time extension to bring the actual S-Curve to the Model S-Curve shape:

## Interpolation Table

### Conclusion:

S-Curve pictures clear situations at all level and shapes the performance path of a project graphically, which precisely examine the input variables and the results qualitatively and quantitatively.

Based on the S-Curve analysis we can answer the question stipulated at the beginning, that we can manage the S-Curve rectification and smoothing the performance process during any project's phase considering the following:

- Project's Failure in some aspects is inevitable, but bringing the outcomes to the successful end is the challenging corner-stone in any project.
- Risk and failure are viewed as lessons learned for future, thus the variation is a hallmark of creative practice in any project when it adds values, and when it enriches PM practice with exiting new ideas.
- By reading the S-Curve carefully and monitoring turning points along the path, we can manage to push the project forwards.
- By smoothing S-Curve through coordination and supporting activities of team's participation in meeting the time schedules.
- By flagging the problems and the vital issues by all participants and concerned groups at the right time.
- Besides maintaining the contractual and quality obligations, we can enhance flexibility of work conditions by new approaches and alternatives to strengthen better solutions.
- Adapting creative approach in managing the whole process such as walking-management, and walking meeting progress on the spot, besides the traditional progress meeting to insure the interaction among the participants, and turning the r knowledge into action.

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