PROFESSIONAL PROJECT MANAGEMENT
THE BASIS FOR SUCCESSFUL INVESTMENT

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ABSTRACT

Cement plant projects are related to major investments and hence careful planning, structuring, management and supervision of the project is a key for its success. The right project structure, - turn key project or multi package project, the proper supervision and project schedule control is essential and decisive for the success of the entire project. Only a one month of delay of the production of a 5000 tpd clinker production line at a cement price of 100 US$/t results in a financial damage in production equivalent to 15.75 Mio. US$, not including consequential damages, like the loss on interest rates.

However project management is not the core subject of cement manufacturers. Hence the know-how and the human resources with modern project background are limited and specialized support from experienced consulting companies is recommended.

Basically cement plant projects can be divided into:

a) Greenfield projects, and
b) Optimization, modernization or capacity increase projects of existing cement plants.

For greenfield projects a proper feasibility study is used as basis for the financing support and the permit processing. Secondly the structure of the project has to be decided upon and the general design and lay-out of the plant has to be elaborated. To minimize investment costs a proper and comparable tendering, proposal evaluation and optimization is of significance. Support of contract design with international equipment suppliers and construction companies and related guarantee formulation requires a detailed know-how and experience. During the project execution the checking and approval of drawings and specifications, the manufacturing quality control and the site supervision needs experienced personnel of a variety of fields, e.g. process, mechanical, civil, electrical and automation engineers. This is also concerning the commissioning supervision and the taking-over procedure.

Optimization, modernization or capacity increase projects start usually with a plant audit and a project study as the existing facilities have to be considered and/or incorporated into the project. Within the project study the major equipment will be specified and a general lay-out will be elaborated as basis for the permit processing and the tendering phase of the project. During the execution phase of optimization, modernization or capacity increase projects similar services than for greenfield projects have to be performed.

Even after the commissioning consultancy services are beneficial to the cement plant. This is mainly related to the optimization of the production, the training of operators or the delegation of experts for technical support and as well as the final implementation and support on the spare part procurement.

PEG S.A. is the leading, independent and international consulting engineer as well as the partner of the Russian Cement Industry. We supply experienced consultancy and engineering services for all kinds of projects on a customized basis for maximum profitability and return of investment.

1. INTRODUCTION

Cement plant projects are related to major investments and hence require careful planning, structuring and management. This is concerning greenfield plant as well as optimization, modernization and capacity increase projects of already existing cement plants.

Taking into consideration that one month of delay of the start-up of a 5000 tpd clinker production line could result in 15.75 Mio. US$ on losses of production based on a cement price of 100 US$ per tonne. This amount is not including consequential financial damages, e.g. losses on capital interests. In addition the optimization of a plants concept and the equipment design and arrangement could save up to 20 % of the investment costs according to the experience of PEG S.A.. The target of a professional project management is to optimize the investment costs and keep the time schedule of the project under control.

However project management is not the core-business of a cement manufacturer. For this reason the know-how and the human resources with experience in project management are often limited. Specialized support form internationally recognized consulting companies are essential and cover the various requirements of a cement plant project.

A cement plant project can be broken-up into the following phases:

PHASE I: FEASIBILITY STUDY (OR PLANT AUDIT IN CASE OF EXISTING PLANTS)

PHASE II: PROJECT STUDIES AND BASIC ENGINEERING

PHASE IIIA: TENDERING AND CONTRACTING

PHASE IIIB: ASSISTANCE FOR PERMIT PROCESSING

PHASE IV: EXECUTION OF THE PROJECT (INCLUDING PROJECT ENGINEERING, MANUFCTURING CONTROL AND SITE SUPERVISION)

PHASE V: START-UP, COMMISSIONING AND TAKING OVER

These phases are usually addressed by the project management. The major targets and commitments within each phase are discussed in the following.

2. PHASE I: TECHNO-COMMERCIAL FEASIBILITY STUDY

A techno-commercial feasibility study is the first step within a cement plant project. This is concerning not only greenfield projects but also projects within existing cement plants. In the later case a plant audit is usually part of the feasibility study as existing plant facilities and/or machinery have to be included or considered within the project.

Within a feasibility study a careful review of the market situation including a projection of the expected future development has to be evaluated. Than suitable raw material and fuel resources need to be explored and the quality of the raw materials (and the fuels) have to be proven by a sufficient number of analysis. Based on a geological drilling programme the reserves of the raw material resources are determined being an imperative basis for the project and investment planning. Once the raw materials and the necessary fuels are identified the optimum location of the plant has to be selected and investigated considering the availability of land, logistics and infrastructure.

Based on the properties of the raw materials and the fuel(s) as well as the proposed plant site the technical process including the specification of the key equipment will be determined. This basic process design will be transferred into mass- and process flow sheets and into equipment lists. An estimation of

the investment and operation costs is then carried out using all technical elaborations. The execution structure of the project, - turn key, semi-turn key or multi package – will be already considered in the investment estimation as the contingencies will have a significant influence. Also different financing options with optimized profit and taxation duties are part of the feasibility study.

In most cases the results of a commercial project elaboration have to meet “bankable” quality and status. This means that the documents of such a bankable study are used to loan investment capital from banks. PEG is performing “bankable” investment and feasibility studies on the basis of the internationally accepted UNIDO-program and procedure (UNITED NATIONS INDRUSTRIAL DEVELOPMENT ORGANIZATION).

Finally, if necessary an environmental impact study considering all kinds of emissions and influences to the neighbourhood have to be considered in this early stage of the project. The environmental impact study is also necessary for permit purposes.

3. PHASE II: PROJECT STUDIES AND BASIC ENGINEERING

Once the project is technologically and commercially proven as feasible more detailed project studies and a basic engineering is necessary. During this phase a detailed drilling campaign and analysis of physical and chemical properties of raw materials and a detailed geological survey (lithological, stratigraphical and tectonical) will be carried out and the estimated raw material reserves will be verified. On the basis of the results of the drilling campaign an exploitation plan of the quarry area has to be elaborated as well as the necessary excavation technique and the related quarry equipment has to be determined.

Also the necessary geotechnical investigations to analyse the properties of the soil on the plant site will be carried out within this stage of the project.

The plant concept elaborated during the feasibility study will be verified, optimized and more detailed equipment specifications, flow sheets and specifications for the civil works will be carried out.

Finally the responsibilities within the project team and between all interfaces within the contractors will be determined. A list of possible suppliers for equipment and contractors for civil and erection work will be introduced. A final project report including an executive summary for the approval of the project by the board of the client will be elaborated.

3.1 DEFINITION AND ANALYSIS OF THE PROJECT STRUCTURE CONSIDERING RUSSIAN PROJECT PARTICULARITIES

Within the project study and basic engineering particular considerations and comparisons are necessary in order to determine the optimum project structure. This evaluation has a significant influence on the further course of the project.

There are basically three different project structures to be discussed and analyzed for the execution of each project (see Fig.1):

To execute a project on a **turnkey** basis reduces the number of interfaces and responsibilities on the first view. However behind a turnkey contractor there is a number of subcontractors and therefore the turnkey execution structure of a project does not necessarily guarantee a successful project. Nevertheless the control and supervision work for the project management remains. In addition a turnkey contract includes significant project contingency costs usually in the range of 10 %.

In a **semi-turnkey** project structure the project is divided in up three supply- and work contracts. The first one is usually a contract for the supply of all mechanical and electrical equipment as well as the related equipment engineering. A second contract could cover the necessary civil engineering, the civil and erection work for equipment on site. Finally the locally manufactured equipment is subject to a further contract with workshop(s). The advantage is that the project risk contingencies are reduced. On the other hand three interfaces between the different suppliers and works contractors have to be handled. To do so successfully experience in international contracting and profound supervision and project management is essential.

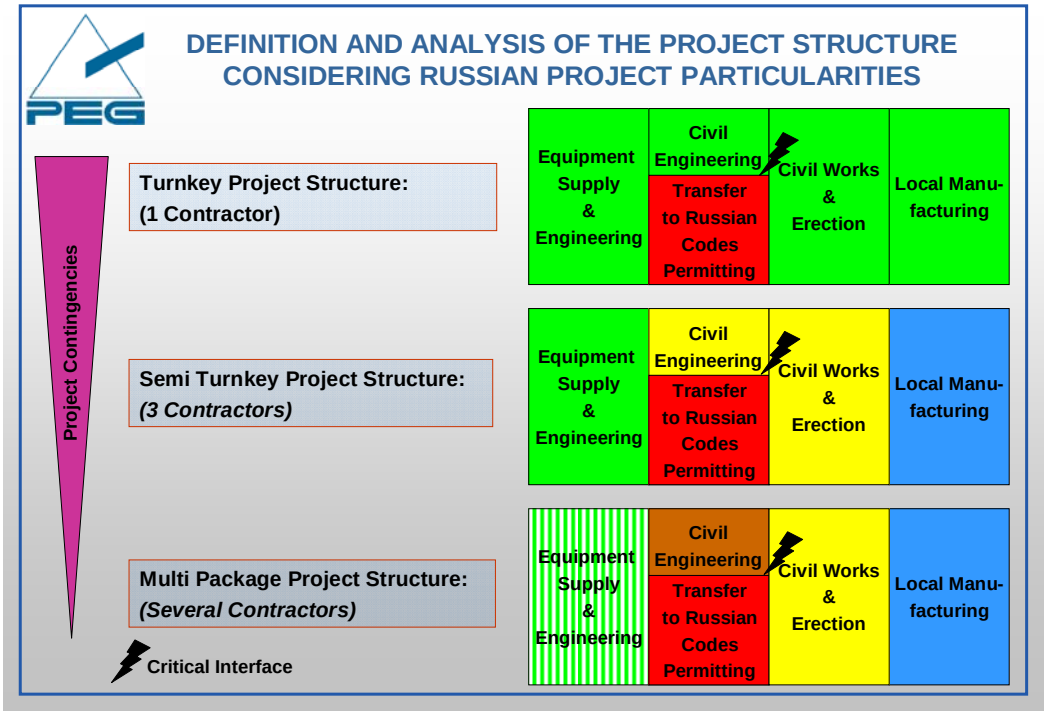

Fig.1: Overview of different project execution structures examples.

By a **multi package** project execution structure a minimum of project contingency costs can be achieved. In such a case the delivery of equipment is often broken up into several contracts with equipment suppliers for mechanical and electrical equipment. Furthermore the civil engineering, the civil and erection works as well as the local manufacturing is awarded to separate contractors. By this measure the optimum price to service ratio can be selected and the project is carried out by specialized companies. This results in significant savings on the project costs. However it is obvious that the various interfaces between the different contractors have to be coordinated and a sophisticated project management team is necessary.

Due to the Russian permitting process carried out by licensed engineering offices (Design Institutes) a particular situation concerning all types of project structures applies. There are generally two options to elaborate the necessary civil engineering: If the civil engineering and the related drawings are derived from foreign engineering companies they have to be transferred into Russian civil codes. This is necessary for the construction permits. The other option is the licensed engineering office (Design Institutes) takes over the complete civil engineering and elaborates the related drawings. According to the experience the interface from the licensing company to all other parties of the project have to be judged as very critical. This particular interface should to be very carefully addressed, monitored and supervised by the project management.

3.2 TYPICAL PROJECT MANAGEMENT STRUCTURE

A schematics of a typical structure of a project management is displayed in Fig.2. The light red colour indicates the project management team necessary from the side of the owner. Supervision engineers of different technical disciplines as well as other necessary staff are listed. The owner is supported by PEG´s project management and consulting team indicated by the light blue colour. The consultants services are split up into offices services, e.g. project planning, documentation, check and approval of mechanical, electrical and civil drawings on the one side and site supervision services in different disciplines on the other side. The communication, flow of orders and administrative relations between the owner/consultant and the equipment supplier, the engineering company, the civil and the local fabrication works are outlined. Again the particular situation for the permitting process in Russia by licensed engineering offices was included and considered in this project management structure.

However each project is unique and for this reason a the project management structure have to be adjusted according to the particular requirements of each project.

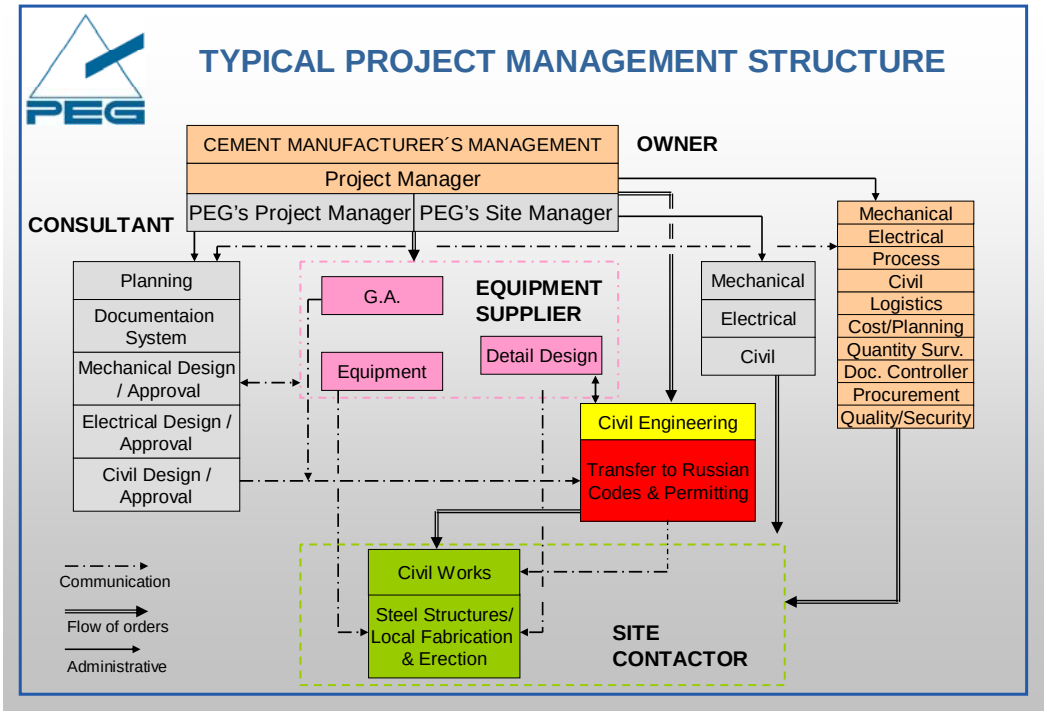

Fig.2: Schematics of a typical project management structure.

4. PHASE IIIa: TENDERING AND CONTRACTING

After approval of the project and based on the selected project execution structure tender documents for the supply of mechanical and electrical equipment, engineering, permitting works, civil design as well as for the civil construction, equipment erection and local manufacturing works have to be prepared. This is carried out on the basis of the equipment specifications and the plant concept elaborated during the project study and basic engineering phase of the project. It is of importance that the tender documents as well as the required proposals from equipment manufacturers and/or contractors are following

international quality standards in order to perform a proper analysis, optimization, comparison and evaluation of these proposals.

According to the experience of PEG the preparation of suitable proposals form equipment suppliers and contractors requires a time frame of 3 to 4 month. This preparation time can be used to prepare and approve contract drafts for the negotiation with the possible suppliers and contractors. The draft of such contracts requires international and profound project experience. In many cases special requirements of the Russian legislation and the loaning banks need to be considered in the contracts.

Finally contract negotiations have to be performed and the contracts have to be signed. Again the contract formulation, the structure of the contracts, the definition of interfaces and the formulation of performance and project guarantees require a high degree of project management experience.

5. PHASE IIIb: ASSISTANCE FOR THE PRERMIT PROCESSING

For the permitting process the material, mass flow and consumer lists of the plant concept have to be checked regarding the local regulations and laws. For the definition of dust, gas and noise emission levels it is recommended to consider not only the existing limits but to include projections to the future and more restrictive environmental regulations.

For the civil construction permits, the Russian civil codes have to be applied. The transfer of engineering and civil design drawings into the Russian codes can be carried out only with the help of a licensed engineering office (Design Institute). However as per experience, the interface between international engineering companies and the transfer into Russian codes carried out by a local engineering office (Design Institute) needs intensive supervision and coordination from the project management.

Another subject of the project management is the coordination and supervision of the import licensing for equipment.

6. PHASE IV: PROJECT EXECUTION

During the execution of the project the control and supervision obligations of the project management consisting of a joint team of experts from the client and the consultant can be divided into:

a) Project engineering and manufacturing control (Office)

b) Site supervision and local manufacturing control (Construction site)

To cover all the supervision and control functions a office as well as a site team of different and experienced engineers dedicated to the project has to be taken in place.

The major subject of the project management during the execution period is the coordination of the different interfaces between the equipment supplier(s), the engineering, permitting, civil and erection companies. The check and approval of design drawings related to the mechanical and electrical equipment and civil works within a limited time requires sufficient and experienced project engineers.

Besides the projects budget and the projects progress time schedule have to be monitored on a daily basis. A project time delay alert system is recommended and qualified measures to recover time delays

are necessary. To do so, regular project meetings with all parties involved in the project have to be performed and weekly as well as monthly progress reports should be elaborated.

Furthermore the flow of payments according to the projects progress and the payment terms of the contract(s) must be controlled.

The quality of the engineering works according to the specifications as well as the quality of the manufacturing of imported equipment need to be inspected and approved by experts.

On the construction site a site project manager and a team of engineers is following up the actual construction and erection works. They are coordinating the site activities between different contractors and engineering companies and check the conformity of the construction and erection work according to drawings, specifications and regulations.

In addition all equipment delivered has to be checked for completeness and approved in order to release related payments.

Detailed reporting and coordination with the project management in the office on the actual progress related to the time schedule of the project is essential to identify and catch up delays.

Besides the project management on site is obligated to perform an active claims management and reporting if contractual responsibilities are violated. Another main activity is the quality control of locally manufactured equipment.

7. PHASE V: START UP, COMMISSIONING AND TAKING OVER

After the construction and erection period an efficient and speedy start up and commissioning period is crucial in order to achieve nominal capacity as soon as possible. The basis to achieve this target is a proper and competent supervision and project management during the construction period because previously made errors can deteriorate the start up significantly.

At first a detailed start up programme and scheduling considering the actual condition of each section of the plant has to be elaborated.

Than the installed equipment will undergo final checks, “no load”, signal, interlocking and “load test” which have to be certified. During this period deficiency lists have to be elaborated and permanently adjusted.

Once a stable operation of the plant or a plant section is reached a performance test procedure is to be drafted, discussed and agreed between the different parties involved. This is subject to the projects site management.

Based on the performance test procedures the tests have to be carried out and must be controlled by the projects site management team. To do so, experienced commissioning engineers of different technical disciplines are necessary.

These experts are evaluating the results of the performance tests and issue the related certificates or discuss measures of improvement if a guaranteed figure has not been reached.

As a final step, the control of the elimination of remaining deficiencies and the approval of the final taking over certificates is within the obligation of the projects site management.

8. CONCLUSIONS

The execution of a cement plant project is an intensive investment challenge. It needs careful planning, structuring and an experienced project management.
Generally the necessary steps, the targets and the commitment of the project management and execution planning are relatively similar for a green field plant as well as for optimization, modernization or capacity increase projects of existing plants. A project can be divided into the following phases:

PHASE I: FEASIBILITY STUDY (OR PLANT AUDIT IN CASE OF EXISTING PLANTS)
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PHASE IV: EXECUTION OF THE PROJECT (INCLUDING PROJECT ENGINEERING, MANUFCTURING CONTROL AND SITE SUPERVISION)
PHASE V: START UP, COMMISSIONING AND TAKING OVER

The complex interface coordination between different suppliers, contractors and engineers requires experience, know how and experts specialized in each particular stage of a project and on a variety of technical disciplines like, raw material, process, civil, electrical, automation and commissioning engineering. Professional project management is the basis for a successful project.

PEG S.A. as the leading International and Independent Consulting Engineer covers all aspects required and is the dedicated consulting engineer of the Russian Cement Industry in order to successfully execute cement projects.