

## SPACE TECHNOLOGY APPLICATIONS IN ENVIRONMENT OF INTEGRATION ENGINEERING AND MANAGEMENT

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**Abstract-** It is important to state that for the time being the use advances of high technology in the diversity areas of application become highly necessary for achievement expectations in any developments. In conformity with this indication space technology has taken a vital place in variety areas, including in engineering especially in the process of engineering management as a best tool making available of collection required data in needed place and time. It is highly important in management of resources like employee forces, financial options, technological and technical facilities, or any other subjects contenting engineering executions. The fact is that engineering activities in modern life demand to consider a large of number requirements during execution stages. It relates not only successful implementation or solution in point of engineering elements as well as such an important and vital aspects as ecological, environmental, safety and security. This paper is dedicated to use advances of high technology, particularly space technology for collection and integration of all available and accessible information for most suitable engineering solutions. It has been offered a method how space technology can be helpful and provide significant impact during project implementation. It is important to emphasize positive environment for resources management, time factors, minimization of expenses of project thank to space technology contribution.

**Keywords:** Management, Engineering Solutions, Space Technology, Space Image and Processing, Remote Sensing, GIS, Topographic Map, Field Survey.

### I. INTRODUCTION

The term of project execution in general (starting from mobilization stages ending up handover) starts from the stage of preparation and collection appropriate information related to all resources for execution with reflection of activity schedule depends undertaking volume and scale of the project. It is necessary in the initial stage to develop planning schedule reflecting and covering aspects of terms of project stages starting from project design, any considered establishment and design changes with

indication of as-build that as the general circumstance happening within the project execution.

The achievement of goals for satisfaction of clients expectations for construction managers and project staff involved for project planning development and execution is to monitor continuously and support project execution stages which obviously opens an opportunity to meet requirements for successful completion of project. It is highly important to find out most suitable trend and way to embrace answers hot to achieve it or what have to do to be lucky in all stages of execution process.

All indications above make necessary to undertake details of project in the right direction with selection of method creating opportunities in collection, segmentation and systematization of information for project management.

Remote Sensing (RS) with integration into the Geographic Information System (GIS) and tools of Global Positioning System (GPS) are excellent instruments in application for large areas of engineering. They are widely use in a large scale of areas of engineering activities in particular for the planning, monitoring and management of the appropriate utilization of resources at any stages of engineering services starting from tender package development up to as-built process upon completion of construction stages.

Major areas of engineering application are fundamentals of remote sensing and GIS. It can be found out in a variety of engineering disciplines. The fact is that remote sending and GIS technology is the base of data sources, which reflects in the form of map, tables or any other forms. It creates based on geo-statistics, spatial modeling, automated mapping, digital terrain model, GPS data acquisition, and integration of GIS, remote sensing and GPS as well as filed survey data for the final outcomes achievement.

### II. SITE SELECTION

Identifying locations that merit consideration is the purpose of the site selection process. An implementation of this purpose should not be too narrow as to risk eliminating those sites that may be less obvious.

General guidelines used in compiling the main aims of site selection include the following:

- A size approximating what is required for satisfaction of facility construction needs;
- A reasonable location of features of industrial objects;
- Safety and security aspects of industrial object.

It is obvious that site selection is one of the main part of construction execution. It is necessary to state that site selection for construction of industrial facility consists of identification variety of aspects of the site like the development of the site, on the cost and the stability of the proposed structure [1]. The main survey segments should be considered before any construction works in site selection stages:

- Conduct general survey potential site
- Contour survey, establishment of geodetic system
- Local system use in topographical data collection
- Any other features survey

In the meantime as per mentioned above execution of the construction site selection plays significant role is assessment of staff involvement for design as well as construction process. This circumstance make important to undertake before site selection for expected construction activities [2]:

- Natural indicators: site selection should be meet requirements of height as above the normal flood level, which limits execution volume and reduce the cost by the minimizing the earth filling activities. It can be achieved by application of high accuracy topographical survey implementation. It is the way to calculate amount of excavation or back filing works as well as such a features as facilities for drainage system of executed engineering service.
- Soil characteristics: it should be assessed and investigated the soil conditions and bearing capacity to determine the ascertaining the nature of the ground.
- There is a high demand of meeting of standards needed to be focused in site selection that will:
- Construction execution works impact reduce and minimize to the environment;
- Point out any possible threats from the environment;
- Consideration, reduce and minimize of impact of natural resources within site preparation, construction, and operation stages of construction activities; and
- The system of management creation for monitoring, assessment and reduce of possible consequences solid and liquid waste.

As seen, there is no doubt that site selection takes valuable place as the value of the structure in construction of industrial facilities. It demands the surveys to be carefully with consideration all required aspects of site selection [3].

### **III. DATA COLLECTION AND PROCESSING**

It is important to state that engineering execution stage consists construction, maintenance, and management of infrastructures. Internally execution should be embraced social aspects, which can be achieved by development of appropriate management infrastructure for creating safely condition of human life and environment.

Undoubtedly, the aim of expectation of civil engineering is to improve efficiency of related businesses. It demands to create an environment to overcome difficulties relevant to civil engineering businesses. How to achieve it? What required to be undertaken for a success?

In conformity with those indications, management and development of required infrastructure are the bases of increasing and improvement of effectiveness of the civil engineering activities outcomes. In the meantime, it can be achieved by using advances of high technology which makes available successful data collection and data sharing in civil engineering. This approach demands to able to develop the system of information management operating and undertaking short- and long-term period. It gives opportunity to use a wide variety of flexible activity for improvement of engineering services. This is the base of development of successful design stage as well as planning execution based on suitable implementation of data collection mechanism and reuse information as the vital part existing quality management system [4].

Based on above aspects selection appropriate technologies for generation, conduct of observation and measurement assists to collect or obtain required information for management purpose with further target of technologies for re-use and sharing is the option of the subject.

As it is mentioned long-term for instance land slide disaster, reference of information, related to non-engineering services area, in the end can be helpful to make decision. It will give positive impact to the management strategy system within construction works [5].

Factors of management state to combine of classification of features like weather and water-environment, structures and behavior of civil activities, character of natural disasters of the selected area, nature of environment, circumstances of comfort of life and any other conditions.

In the meantime, access of desired information by facilitating a new kind of information collected by use of required technology is required. Because, it becomes important part of management for clear understanding of contents of engineering executions as well as purposeful use of information for best assessment, evaluation and correct choice of segments of construction works. It is obvious that the stage of pre-processing and processing by applying of appropriate software (CAD, Geographic Information System, any other instrument for image processing) have a vital place in various business applications [6, 7].

### **IV. SPACE TECHNOLOGY APPLICATION**

Up to date technology use takes leading place in wide areas of our life, particularly in engineering. Successful integration all above reflected items can be concerned within engineering project executions. Space technology application is one more advantage in engineering applications.

We are providing an example of space technology use in construction of engineering facilities for production of cellulose. It has been stated to collect required information during all stages of executions:

- Development land survey management systems;
- Consideration environmental options;
- Undertake hydrological systems development;
- Architectural issues;
- Soil related subjects: irrigation and drainage system design and construction;
- Communication system development; and
- Any other areas.

Figure 1 shows the area selected for production of cellulose. The use of space technology made available to collect required for execution information of the facility considered details and features of the site. In the meantime it opens an opportunity to manage and storage of information during execution stage and access in needed cases.



Figure 1. Space image of site for production of cellulose

As the main part of space technology implementation it has been done geodetic and topographic survey of selected area.

**A. Topographic Surveys**

In general is the first stage of any construction work which starts from the site survey by application of topographical measurements. It includes:

- General approach and consideration of construction works;
- Existing structure and features merging execution;
- Design execution process;
- Road or bridge design or reconstruction; and
- Any other project design facilities.

**B. Data Projection and Conversion**

The fact is that topographical measurement contains digital data which needed to be integrated into the existing information accessed from different sources. Within the framework of presented project generated data has based on a Gauss Kruger coordinate system, Zone 8 using Pulkovo 1942 as the reference datum. Therefore, all data brought into the project for development of geographic information system has converted to Gauss Kruger system where area for construction is located.

- Equipment deployed

1. GPS 5700, 5800
2. TCR-407

3. SN 678106
4. TC-1202
5. SN 227798
6. Leveling Instrument 3H5JI N 0351812 and 3H5JI N 0354862

The topographical survey was carried out using the tachometric survey with the contour interval 0.5m for detailed collection of information of features of the site.

During the topographical survey, in addition to the benchmarks and survey points, the transition points with wooden packs were installed.

The survey was carried out using electronic tachometer TCR 407 (by Leica) with plugged-in application program. The topographic survey data collected in the TCR 407 was imported into hand-held computer via Leica Geo Office Tools software. The land survey processing was carried out using the Autodesk Land Desktop software (Civil Design module). In the result of desk data processing, the electronic versions of topographical survey plot plans were obtained. Figure 2 demonstrates the results of topographical survey.

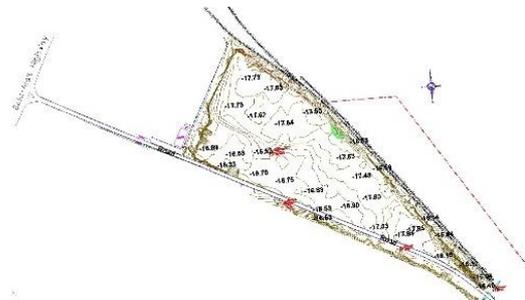


Figure 2. Topographical survey results of the site

Remote sensing method was a base instrument of collection data of the site surface with detailed picture. It is important to indicate that all collected information were based on development of geographic information system (GIS). The layers of GIS development were reflected in the form of tables or maps with main items of site (Figure 3).

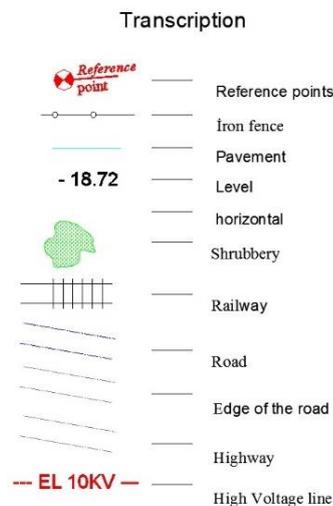


Figure 3. Items of the site

The fact is that site investigation with space technology application was not limited only area undertaken for facility of cellulose production. It was embraced a wide area for the reason of consideration in advance of integration of facility into the communication system existing in the area.

The quality of remote sensing method application and GIS developments depends of the elements integrated into the system, that is the quantity of layouts are defining quality of database developed by means of space technology. It makes possible to protect or minimize of environmental consequences of production since a suitable and most correct engineering decisions can be foreseen thank to comprehensive information throughout access of space technology application.

### V. CONCLUSIONS

This paper dedicated to construction of engineering facilities for production of cellulose. It has been shown use of space technology advances in all stages of engineering activities. Space technology application with use of remote sensing method and geographic information system development is played main place in engineering facility construction. At the same time it has been demonstrated special impact of modern technology application in environmental and ecological safety areas of engineering which has today a vital point in construction.

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### BIOGRAPHIES



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