FACULTY OF INGEGNERIA GESTIONALE / INDUSTRIAL ENGINEERING

COURSE: M.Sc MANAGEMENT ECONOMICS & INDUSTRIAL ENGINEERING

MASTER THESIS PROJECT

PROJECT ACTIVITY PLANNING IN ENGINEERING, PROCUREMENT AND CONSTRUCTION (EPC) OIL & GAS PROJECT FOR THE REALIZATION OF NITROGEAN GENERATION PACAKAGE (SKID)

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IN COLLABORATION WITH

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ACADEMIC YEAR: 2012

POLITECNICO DI MILANO (COMO)
ACKNOWLEDGEMENT

I would like to express my thanks to Prof. Mauo Mancini as being my project supervisor. My sincere thanks also go to Stefano Crippa, Stefanno Zacchi, Enrica Sangalli and other colleagues at ECISGroup S.p.A for being always supportive. I also express my heartfelt gratitude to my friends Sonia Fuschetti, Letizia Fuschetti and Nicola Fuschetti for their indespensable cooperation and support during my internship.
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CHAPTER 1

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CHAPTER 2

2. PROJECT ABSTRACT:

Internship was done in the project management department of Italain company called **ECIS Group SPA** in Oil & gas sector, during internship trainee interacted with all departments and understood the basic company function, had done project review on oil and gas sector and analysed the **EPC** (Engineering, Procurement and construction) contracting project’s process for the realization of SKID in Oil & Gas upstream and down stream.

Trainee participated in one of the EPC project **“Nitrogean generation SKID “** for a saudia arabia client. In the project Intern worked in the project management department and was assigned the role for supplier evaluation, Project cost analysis, Project activity planning (gantt chart) and the development of economical progress curve.

In the last phase of the internship intern was placed in a research and development (R&D) group where he participated in a (R&D) team and interviewed 18 company managers and CEO on bases of developed questioners, we have interviewed the managers and analyzed the problematic operating segment and their respective problems in form of histograms.

In general intern participated in following activities for “ Nitrogean Generation package SKID”

- Supplier evaluation
- Cost analysis
- Activity planning (Gantt chart)
- Development of economical progress curve
- Resreach and development (interview )
CHAPTER 3

3. INTERODUCTION ON EPC CONTRACT IN OIL & GAS SECTOR

In this section we will discuss a generic description of oil & gas upstream and down stream industry, we will highlight the characteristics of EPC (Engineering, procurement and construction) contracts signed by EPC companies with the clients for the construction of machine called SKID in big oil & Gas plants, We will also expalain the difference between EPCM, EPC and EPCI contract relevent to Oil & Gas sector.

3.1 OVERVIEW OF OIL & GAS :

The oil and gas industry is usually divided into three major components:

1) Up stream
2) Mid-stream
3) Downstream

The upstream oil sector is a term commonly used to refer to the searching for and the recovery and production of crude oil and natural gas. The upstream oil sector is also known as the exploration and production (E&P) sector.

Upstream sector includes the searching for potential underground or underwater the oil and gas fields, drilling of exploratory wells, and subsequently drilling and operating the wells that recover and bring the crude oil and/or raw natural gas to the surface.

The midstream gas business starts at the gathering system. The gathering system collects wet natural gas from the wellheads and transports it to a gas processing plant. The gathering system can range from a small system where gas is processed close to the wellhead, to a system that consists of thousands of miles of small-diameter, low-pressure pipes collecting from hundreds of wells. At the gas processing plant, methane (dry natural gas) is separated from wet natural gas, leaving natural gas liquids (NGL) as a by-product. NGLs are the heavier elements of the wet natural gas, which include ethane, propane, butane, isobutane, and other condensates. Midstream companies make money
by fractionating, transporting, and marketing these natural gas liquids. Though midstream operations are usually included in the downstream category.

The **downstream** oil sector is a term commonly used to refer to the selling and distribution of natural gas and products derived from crude oil. Such products include liquified petroleum gas (LPG), gasoline or petrol, jet fuel, diesel oil, other fuel oils, asphalt and petroleum coke.

The downstream sector includes petroleum product distribution, retail outlets and natural gas distribution companies. The downstream industry touches consumers through thousands of products such as gasoline or petrol, diesel, jet fuel, heating oil, asphalt, lubricants, synthetic rubber, plastics, fertilizers, antifreeze, pesticides, pharmaceuticals, natural gas, and propane.

**3.2 OIL PRODUCTION PLANT:** An oil production plant (sometimes called an oil terminal) is a facility which performs processing of production fluids from oil wells in order to separate out key components and prepare them for export. This is distinct from an oil depot, which do not have processing facilities.

Typical production fluids are a mixture of oil, gas and produced water. Many permanent offshore platforms have full oil production facilities on board. Smaller platforms and subsea wells must export raw production fluid to the nearest production facility, which may be on a nearby offshore processing platform or an onshore terminal.

**3.3 TRANSPORTATION:** Pipeline transport is the transportation of goods through a pipe. Most commonly, liquids and gases are sent, but pneumatic tubes using compressed air can also transport solid capsules. As for gases and liquids, any chemically stable substance can be sent through a pipeline. Therefore sewage, slurry, water, or even beer pipelines exist; but arguably the most valuable are those transporting crude petroleum and refined petroleum product including fuels: natural gas (gas grid), and biofuels.
3.4 OIL REFINARY: An oil refinery or petroleum refinery is an industrial process plant where crude oil is processed and refined into more useful products such as petroleum naphtha, gasoline, diesel fuel, asphalt base, heating oil, kerosene, and liquefied petroleum gas. Oil refineries are typically large, sprawling industrial complexes with extensive piping running throughout, carrying streams of fluids between large chemical processing units. The crude oil feedstock has typically been processed by an oil production plant. There is usually an oil depot (tank farm) at or near an oil refinery for storage of bulk liquid products.

3.5 WHAT IS EPC CONTRACTING:

EPC is an acronym stands for Engineering, Procurement and Construction. It is a common form of contracting arrangement within construction industry.

3.5.1 EPC BACKGROUND:

Under an EPC contract, the contractor designs the installation, procures the necessary materials and builds the project, either directly or by subcontracting part of the work. In some cases, the contractor carries the project risk for schedule as well as budget in return for a fixed price, called lump sum or LSTK depending on the agreed scope of work. When the scope is restricted to engineering and procurement, this is referred to as an EP, E and P or E+P contract. This is often done in situations where the construction risk is too great for the contractor or when the owner does the construction.
The EPC contractor (EPCC) agrees to deliver the 'keys' to a commissioned plant to the owner for an agreed amount, just as a builder hands the keys of a flat to the purchaser. An owner decides for an EPC contract for reasons that include:

1) Reduced stress for owner
2) Single point of contact for owner simplifies communications.
3) Ready availability of post-commissioning services
4) Ensures quality and reduces practical issues faced in other way
5) Owner protected against changing prices for materials, labor, etc.
6) Cost is known at the start of the project
7) Besides the plant siting, in an EPC contract the owner defines: Scope and the specifications of the plant, Quality, Project duration and Cost

3.5.2 OWNER AND CONTRACTOR LIABILITY IN EPC CONTRACTING:

Once an EPC contract is signed, the EPC contractor becomes liable for completing the project according to the tender conditions. The EPC contractor, in turn, may hire sub-contractors to complete different portions. Payment commensurate with the work completed (in addition to an advance) is normally preferred by a contractor. Projects are more likely to succeed when the owner:

1) Defines guarantees well
2) Defines scope and quality very carefully
3) Defines milestones meticulously
4) Defines LD/penalty clauses
5) Makes payment terms very specific
6) Adopts similar terms and conditions as owner regarding quality, guarantee etc., for subcontracts/vendor
7) Coordinate vigilantly to reduce chances of errors at site.
### 3.6 EPCM:

**EPCM** refers to Engineering, Procurement, and Construction Management. It is a common form of contracting arrangement within the construction industry. In an EPCM arrangement, the client, in order to involve an experienced player in large projects, selects an EPCM contractor who manages the whole project on behalf of the client. The EPCM contractor essentially ensures that the whole project is completed as required and in time. Normally, an EPCM contractor completes the basic work such as site surveys, getting clearances from authorities, doing the basic engineering and preparing the site for the EPC Contractors. It further chooses the EPC contractors and ensures the timely completion of the project.

An EPCM contract is a natural progression for an EPC contractor as, if one is able to do an EPC of a project then getting a bigger EPCM job is advantageous. It helps to tap the already present competencies while ensuring better control over the project. Also, the value of the project managed through an EPCM contract is far greater than the individual EPC contracts.

### 3.7 EPCI:

**EPCI** stands for Engineering, Procurement, Construction and Installation. It is a common form of contracting arrangement within offshore construction. Under an EPCI contract, the contractor will design the structure, procure the necessary materials, undertake construction and transportation, and set it up at the offshore site. The contractor does this either through own labour or by subcontracting part of the work. The contractor carries the project risk for schedule as well as budget in return for a fixed price, called Lump sum or LSTK depending on the agreed scope of work.

In EPCI contracts, the contractor rarely carries the project risk. Rather, contractor and customer have detailed discussions on the division of the risk. Risk of delays and cost overruns due to lacking Weather windows is an example of a typical risk that may be born by the customer rather than the contractor.
CHAPTER 4

4. ANALYSIS OF EPC CONTRACTING WITH IN COMPANY:

In this section we have examined

1) Company background
2) Products
3) Company organization chart
4) Company processes (Engineering, Procurement, Construction)

4.1 COMPANY BACKGROUND:

ECIS Group is the integration of the three small size Italian companies. In 2007, after several years of cooperation between, CHEMIT, ECIS and E&C and a commonly shared business experience at international level, the Management decided to accept a new challenge for the developing market - incorporate all three companies in a new holding structure, under the name ECISGROUP. The group combines the human resources and professional skills of all three ISO UNI EN 9001:2000 certified Business Units. Supply covers a wide range of products and services for the Oil&Gas (Onshore and Offshore), Petrochemical and Energy Markets ensuring maximum Customer satisfaction and high technological standards.

In 2008, another goal was achieved: Ecisgroup has changed its legal status into Ecisgroup S.p.A. - a private Company Limited by Shares. As group is a dynamic one, a new target has been set: internationalization, focusing on the GCC countries, Mediterranean area and Eurasia. Group continuous development has led into being the Global Partner of Engineering Procurement Construction for the Oil&Gas, Petrochemical and Energy plants. Company work in National and international EPC projects, companies has produced many Oil and Gas skids in Kazakhstan, Egypt, quarter

CONSTRUCTION SRL + ENGINEERING SRL + INSTRUMENTATION SRL

ECIS GROUP SPA
4.2 PRODUCTS:

Company is specialize in oil exploration, filtration and treatments SKID. The Company products can be summarized as follows:

4.2.1 Skids Fuel Gas Treatment: This SKID is used in (Filtration, Metering, Analysis, Heating, Reducing, Gas Odorizes) - Meter provers Chemical Injection and Gas Treatment

4.2.2 Packages: This SKID is used in early production (manifold, well testing production, 1st and 2nd test separators, oil stabilizers, slug catchers), Water Treatment Plant - Instruments Services Air Packages - Nitrogen and Hydrogen Production (Membrane & PSA).

4.2.3 Analyzer Systems: Analyzer Shelter Packages - Sampling Conditioning Systems for Stack Gas.

4.3 ORGANIZATION STRUCTURE:

Below attached figure shows the organization structure in ECIS Group, on the head of the organization there is Board then Managing director and downward roles and responsibilities are delegated to executives and later on departmental heads and project managers.

FIGURE 1 (Organization Structure)
4.4 CUSTOMER RELATED PROCESSES MAIN STEPS:

4.4.1 PROPOSAL (REQUEST FOR QUOTATION)

Document sent by a potential buyer to potential vendors soliciting price quotes; also called Request for Quotation. Commonly referred to as an RFP, it includes all of the buyer's product or service requirements as well as a description of the required format, timing and content of the price quotes to be submitted. Once RFP is received in ECIS group proposal function contains the following phases:

1) Tender analysis
2) Basic Engineering (mechanical, electrical, instrumental, automation)
3) Request for quotation
4) Technical and commercial offer

The flow charts below show the activities that are involved in the proposal/offer phase.

MANAGEMENT OF TECHNICAL AND COMMERCIAL OFFERS – FLOW CHART

1. Receipt of the Request for Quotation (RFQ)
2. Preliminary research about the project and the EPC involved. Research and print out of the client’s web site
3. Letter to be sent to the client to thank for the involvement and to ask for additional information
4. Use of Gamma system to record the RFQ and consequently obtain
5. Creation of electronic file
6. Insertion of the data into the Q REGOF program
7. Creation of the proposal form
CREATION OF PAPERY DOSSIER

CREATION OF THE PROJECT SUMMARY DOCUMENT

CHECK-LIST REPORTING THE INDEX OF INTEREST; THE CONTINUATION TO BID DEPENDS ON THIS FINAL VALUE

EXAM AND DEFINITION OF THE PAYMENT TERMS AND SUPPLY CONDITIONS

IN CASE THE OFFER INCLUDES A BID-BOND: IF IT IS ACCEPTED IF NOT PROPOSAL OF AN ALTERNATIVE PAYMENT TO THE CLIENT OR THE OFFER IS FINALLY DECLINED

BID-BOND FORM TO BE DULY SIGNED BY THE COMM. MANAGER AND PASSED FORWARD TO THE FINANCIAL DEPARTMENT

FULFILLMENT OF THE BID-BOND REGISTER

THE COMMERCIAL & MARKETING DEPARTMENT INFORMS THE CLIENT ABOUT THE ACCEPTANCE OF THE TENDER WITHIN THE INDICATED DUE DATE

COMMERCIAL DIRECTION TRANSMIT THE ENTIRE DOSSIER TO THE PROPOSAL DEPARTMENT

ANALYSIS OF THE TECHNICAL ASPECTS BY THE PROPOSAL RESP

REQUEST OF THE TECHNICAL CLARIFICATION AND/OR VENDOR LIST TO THE CLIENT

RESEARCH INTO THE DATABASE OF A SIMILAR REQUEST ALREADY DEVELOPED
EXECUTION OF THE PRELIMINARY ENGINEERING (WHERE APPLICABLE)

REQUEST (IF NECESSARY) OF AT LEAST 3 ESTIMATION COSTS PER MAIN ITEM

DEFINITION OF THE COSTS FOR THE DEVELOPMENT OF THE OFFER

PREPARATION OF THE COMMERCIAL AND TECHNICAL OFFER

APPROVAL 3 DAYS BEFORE THE CLIENT’S DUE DATE

OFFICIAL SENDING OF THE OFFER IN COMPLIANCE WITH THE CLIENT’S REQUEST

CONSTANTLY MONITORING OF THE OFFER

EVENTUAL REQUESTS OF TECHNICAL AND OR COMMERCIAL CLARIFICATION FROM THE CLIENT

WAITING FOR THE ORDER ACQUISITION
4.4.2 PROJECT MANAGEMENT

As a service to its clients, ECIS Group manages its projects by utilizing the Project Management ATLAS Methodology, a standardized approach defined through EPC project management practices. Every project follows the project management life cycle outlined below:

![Project Management Life Cycle Diagram]

**FIGURE 2 (PROJECT MANAGEMENT LIFE CYCLE)**

Company does not have project management procedure flow chart like engineering and procurement activities, however for EPC projects is supported by following activities:

1) Project Management
2) Project Engineering
3) Documentation (certificates, operating & maintenance manual)

4.4.3 ENGINEERING

One of the core competence of ECIS group is Engineering, once request for quotation is made engineering department develop Piping and instrumentation diagram, process layout diagram and isometric drawing.

In general ECIS group perform following type of engineering in EPC project for the realization of SKIDs:

1) Process Engineering (Process flow design)
2) Isometric drawing
3) Layout drawing
4) Mechanical Engineering
5) Piping Engineering (Piping and Instrumentation diagram P&ID)
6) Electrical Engineering
7) Industrial engineering
8) Instrumental Engineering
9) Automation Engineering
Flow chart below shows the activities involved in the **Engineering phase**:

1. **INTERNAL KICK OF MEETING/INPUT REVIEW**
2. **EXAMINATION OF BASIC REQUIREMENT**
3. **DEFINITION OF BASIC REQUIREMENT**
4. **DESIGN PLAN**
5. **JOB PLANNING**
6. **DESIGN DEVELOPMENT**
7. **DOCUMENT LIST**
8. **END OF PHASE 1 -**
9. **REVISION OK**
   - **YES**
   - **NO**
REVIEW OK?

YES

NO

DESIGN VERIFICATION

VARIFICATION OK?

NO

YES

ISSUING DOCUMENTS AS BUILD OR FOR

VALIDATION

VALIDATION OK?

NO

YES

END THE JOB
**4.4.4 PROCUREMENT**

Procurement is carried out according to the company procedures and in accordance with the ISO 9001 standards, while for those jobs where the Procurement is done on the Customer’s behalf, procurement procedures dedicated to the specific job are agreed with the Customer and issued accordingly.

1) The preparation of Vendors List during the Bid Phase
2) The issuance of enquiries in accordance with internal procedures
3) The issuance of enquiries in accordance with internal procedures technical requirements
4) The economical evaluation of received quotations, after the technical evaluation phase and Vendors shortlist
5) The negotiation with Vendors
6) The issuance of recommendation
7) The issuance of purchase orders to the approved Vendors
8) The sourcing and procurement of materials both on the domestic and international markets through a network of ISO certified suppliers

The flow chart below shows activities involved in the Procurement process:

- Proposal/PM sends TRO and attached doc to procurement
- CP assigns the job to a buyer
- Buyer prepares bidder list from vendor list and/or indications from proposal/PM
- Buyer sends RFQ and attachments to suppliers and monitors the preparation of the quotation by the supplier
- Buyer gives technical clarification with the support
- Do supplier need technical clarification?
  - Yes
  - NO
  - Buyer prepares bidder list from vendor list and/or indications from proposal/PM
  - Buyer sends RFQ and attachments to suppliers and monitors the preparation of the quotation by the supplier
  - Buyer gives technical clarification with the support
  - Do supplier need technical clarification?
  - Yes
  - NO
BUYER RECEIVES QUOTATIONS FROM POTENTIAL SUPPLIER

BUYER SENDS THE QUOTATION TO PROPOSAL / PM

BUYER GIVES TECHNICAL CLARIFICATION WITH THE SUPPORT OF SUPPLIER

DOES PM NEED TECHNICAL CLARIFICATION

YES

NO

IN CASE OF ORDER AWARD PLEASE REFER TO THE JOB PHASE
CHAPTER 5

5.1 EPC PROJECT DETAILS: ECIS group participated in the tender offered by client to make skid for nitrogean generation, tender contains two important documents: financial document explaining the cost of project and scope of supply document explaining the material, engineering and welding techniques used in the construction of SKID.

5.2 ROLES AND RESPONSIBILITY: Intern was given a role in proposal department to write project document including scope of supply, process, quality, testing and verification, battery limit, shipment procedure and warranty and cost estimation.

5.3 PROJECT DOCUMENT DESCRIPTION:

- SCOPE OF SUPPLY
- SUPPLY CONTENTS
- TECHNICAL DESCRIPTION
- PAINTING
- BATTERY LIMITS
- EXCLUSIONS
- DOCUMENTATION
- INSPECTION AND TEST
- QUALITY ASSURANCE
- WARRANTY
- PACKING
- TRAINING DESCRIPTION
- DELIVERY CONDITIONS OF SUPPLY
- COST ESTIMATION

5.3.1 SCOPE OF SUPPLY: In scope of supply we define the objective of the project, name of the product and all possible conditions applied to project.

Nitrogen Generation Packages will be supplied prefabricated, fully arranged on skids with all components, accessories, integral piping, instruments, and valves for the installation of the system in condition “ready for operation”. 
5.3.2 SUPPLY CONTENTS: In supply contains we define all direct and indirect activities used in and after the construction of skid. In the construction of Nitrogen generation package skid the supply includes following:

- Unit design, subject to the purchaser approval
- Preparation and submission of the required documents
- Material procurement, fabrication and shop assembly
- Painting
- Insulation material and installation
- Shop inspections and tests
- Materials and tests certifications
- Data book and installation / operation / maintenance manuals packing for shipment
- Delivery Ex-Works loaded

5.3.3 TECHNICAL DESCRIPTION: In technical description we describe equipments, instruments, materials and all technical terminology and symbology due to complexity of different codes and standards in oil and gas industry, for example for a flange we should know its pressure rating, type of welding, dimension, material and design code etc.

For nitrogen generation package skid, down below explain the technical details. Each Nitrogen Generation Package will include the following major components:

1. Coalescer Filter having the following characteristics:
   **Type:** Vertical
   **Design code:** ASME VIII Div.1
   **Inspection Code:** U Stamp
   **Materials:** Carbon Steel
   **Nozzle Schedule:** Inlet: ø 4” ANSI 150# RF Outlet: ø 4” ANSI 150# RF

2. Pressure vessel having the following characteristics
   **Type:** (Horizontal Type)
   **Material:** Carbon steel ASTM A 106 Gr.B
   **Design Code and Construction:** ASME div.1 U Stamp Vessel
   **Nozzle Sizes:** Inlet/Outlet 4” NB 150#RF/RFN

3. Electrical Heater having the following characteristics
   **Heater Rating:** Unknown
   **Electrical Supply:** 415V, 3ph, 60 Hz
   **Connection:** delta
   **Element to Tube Plate:** the elements will be attached to the tube plate using a welded standpipe and which provides a seal for high temperature and pressure
5.3.4 PAINTING: Colour of the skid is one of the important element of security due to its exposure to environment. The surface painting will be performed in ECIS group workshop on progressive basis and before any detrimental corrosion will occur. All pipe, valves, fittings and structural steel will be painted in accordance with the following schedule:

- Sa 2 - ½ Blast
- Primer Zinc rich Epoxy (50 micron)
- Intermediate Epoxy (2x100 micron DFT)
- Top Coat Polyurethane (50 micron DFT)

5.3.5 BATTERY LIMITS: Battery limit are the starting and ending point of the EPC project in a big Oil & Gas plant project, expressed in Piping and Insrtumentation diagram (P&ID) as a starting point and finishing point.

5.3.6 EXCLUSIONS: Exclusion defines the work out of scope of supply, in Nitrogean generation package skid following are the exclusion for which ECIS group is not responsible.

- All engineering details out of the scope of supply
- All civil, mechanical, electrical and instrumentation works at job site.
- Site supervision for erection works, commissioning and start-up (assistance priced separately at unit rates).
- Expenses of customer’s personnel, during workshop testing.
- MCC, feeding power cables & skid lighting system.
- All cabling outside battery limits and connecting cables with the client control room and SCR control panels.
- Spare parts for two years operation.
- First start-up
- Tests at site (test run and performance tests).
- Equipment and tools for erection and maintenance of the package.
- Any materials and/or supplies not listed in this offer.
5.3.7 DOCUMENTATION: During different phases of the project client is informed through technical documents the overall information and status of the project.

5.3.7.1 Project supply: Supply include delivery of the following documents
- Time frame
- P&I diagram
- Quality doc

5.3.7.2 Calculation:
- Certified drawings of equipment
- Certified drawings of piping
- Certified drawings of steel structures
- Certified drawings of instruments hook-up and wiring diagrams
- Data sheet for instruments
- Spare parts lists for two years operation
- Data reports for equipment
- Material certificates (EN 10204 type 3.1) Test certificates
- Mechanical data book
- Installation, operating and maintenance manual

5.3.8 INSPECTION AND TESTING: Defines the type and procedure of testing for example at welding point ECIS group make non destructive (NDT) laser testing in order to verify the endurance of the joints.

ECISGROUP conduct the inspection and quality assurance of materials and equipment and for the standard of the workmanship. A quality dossier will be submitted after testing, complete with certificates and test results. All system testing will be performed in accordance with an Inspection and Testing Procedure that will be issued by ECISGROUP and submitted for Customer approval before the commencement of testing. The system will be thoroughly tested to verify conformance with the approved project documents and specifications. The following tests shall be performed during the construction and/or before delivery:

- Individual instrument test in factory
- Factory Acceptance Tests (FAT) in ECISGROUP
5.3.8.1 Factory Acceptance Tests in ECISGROUP:

The following tests will be performed during the construction phase or during the FAT test before delivery. Visual and Dimensional Check. This test activity will include the following:

- Visual checks
- Lay-out and dimensional checks
- Mechanical assembly
- Tag numbers, equipment nameplates

5.3.8.2 Material Inspection: Material inspection is done to verify the mechanical properties of the part appropriate for the specific application in terms of pressure tolerance and thermal strength.

Material check verify that the material used for pressure parts are conform to the drawings, data sheets and specifications by checking material test certificates and other test reports.

5.3.8.3 Mechanical Checks: Mechanical Checks of equipment to verify the compliance with the specifications and individual data sheets.

5.3.8.4 System Non-Destructive Testing: NDT testing is used to test the strength of welded joints. All butt weld two inch larger will be 100% x-rayed in accordance with ANSI B 31.3 and interpreted per B 31.3. All non pressure bearing welds shall be visually examined except for the lifting lug attachment welds, shall be examined by magnetic particle or dye penetrant to AWS D1.1 interpretation.
5.3.9 QUALITY ASSURANCE: ECISGROUP Quality System is in accordance with ISO 9001: 2008. “Det Norske Veritas” has carried out the qualification process, and released the relevant certificate of compliance with the standard.

The design, the engineering, the supply of equipment, the construction and the assembling of the ECISGROUP products will be carried out in accordance to the provisions of its Quality Assurance Manual that shows the Quality Management System and the followed procedures to meet the requirements of the quality standards.

5.3.10 WARRANTY: ECISGROUP guarantees all equipment to be free from defects in material and workmanship for a period of 24 months from the delivery of the equipment, or 12 months from commissioning which comes earlier. The equipment and all accessories are guaranteed to perform satisfactorily under the specified operating conditions.

The guarantee will cover any design, material, manufacturing or operating defect of the supply, as well as any abnormal wear, provided the supply is used in accordance with the requirements set forth in the Order. This guarantee shall not apply to normal wear and tear or any equipment which has been subjected to misuse, neglect, accident or improper maintenance. Seller will repair or replace any parts acknowledged to be defective returned to Seller’s works.

Whenever the repairs out of necessity must be affected at the installation site, expenses and costs connected with travel and accommodation shall be invoiced and borne by the Purchaser.

5.3.11 PACKING: Packing will be carried out specifically in order to permit the delivery of the Goods in good conditions to the installation site by sea, road or air as required by the project specifications. The following type of packing will be supplied. The skid unit will be packed into wooden crate export type suitable for sea transportation. Where required for protection during transportation, instruments and junction boxes shall be additionally protected. Enclosure windows shall be protected by a layer of foam and covering for plywood. At the flanged connections will be protected by wooden cover bolted in place. Any protective means used on surfaces to be connected in field and/or machined surfaces will be gun-less and easy to be removed. Slinging shall be made from the base of skid and provision shall be made for slings to be attached by shackles to their lifting lugs.
5.3.12 TRAINING DESCRIPTION: The training at site will be carried out in two phases by a specialized and experienced in the gas field ECISGROUP supervisor. The training of the client’s personnel (No. 4 people medium educated, English speaking and able to operate on industrial plants) will be organized as follows:

- First phase (theoretical stage): three days
- Second phase (practical stage): three days

5.3.12.1 FIRST PHASE DESCRIPTION: The first phase, carried out before starting the erection of the Nitrogen Generation Package by a ECISGROUP technician specialized and experienced in the gas field, shall be used to inform the client’s personnel on the following:

- Types of supplied equipments
- General information on the supplied equipment
- Basic design data
- Equipment characteristics
- Used materials
- Special components and accessories
- Data sheets and constructional drawings explanation
- Instruction manual for erection, operation & maintenance explanation
- Controls and tests to be done
- Final tests and hydrostatic tests

5.3.12.2 SECOND PHASE DESCRIPTION:

The training shall be used by ECIS Group supervisor to inform the Client’s personnel on the following:

- Erection of the equipment
- Final cleaning of the installed equipment
- Operation of the equipment
- Maintenance of the equipment
5.3.13 COST ANALYSIS:

In order to make a skid ECIS Group buys material from the suppliers including Heat exchangers, pumps, turbine, control valves, piping, fittings, junction boxes, memberans, mechanical bulk material and electrical bulk material

Table below shows the glance of material, actual cost, markup % of the cost purposed by supplier and final cost with markup presented to client.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SUPPLIER</th>
<th>QUANTITY</th>
<th>MB %</th>
<th>UNITARY COST</th>
<th>TOTAL COST</th>
<th>FINAL COST TO CLIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILTRI U STAMP (ID 8&quot; H2,3m)</td>
<td>PECO-FACET</td>
<td>8</td>
<td></td>
<td>7300</td>
<td>58400</td>
<td>58400</td>
</tr>
<tr>
<td>ELECTRIC HEATERS (25 Kw)</td>
<td>EXHEAT</td>
<td>8</td>
<td></td>
<td>8000</td>
<td>64000</td>
<td>64000</td>
</tr>
<tr>
<td>VESSEL FOR HEATER</td>
<td>EXHEAT</td>
<td>8</td>
<td></td>
<td>7500</td>
<td>60000</td>
<td>60000</td>
</tr>
<tr>
<td>QUADRO SCR EXD</td>
<td>EXHEAT</td>
<td>8</td>
<td></td>
<td>20000</td>
<td>160000</td>
<td>160000</td>
</tr>
<tr>
<td>DOCUM. / PACKING / TRANSP.</td>
<td>AIR PRODUCT</td>
<td>1</td>
<td></td>
<td>4200</td>
<td>4200</td>
<td>4200</td>
</tr>
<tr>
<td>MEMBRANE</td>
<td>AIR PRODUCT</td>
<td>240</td>
<td></td>
<td>3050</td>
<td>732000</td>
<td>732000</td>
</tr>
<tr>
<td>ON/OFF VALVES 3&quot; 150# RF</td>
<td>AIR PRODUCT</td>
<td>8</td>
<td></td>
<td>4000</td>
<td>32000</td>
<td>32000</td>
</tr>
<tr>
<td>CHECK VALVES 1 1/2&quot;</td>
<td>LVF</td>
<td>8</td>
<td></td>
<td>200</td>
<td>1600</td>
<td>1600</td>
</tr>
<tr>
<td>PSV</td>
<td>TYCO</td>
<td>8</td>
<td></td>
<td>1800</td>
<td>14400</td>
<td>14400</td>
</tr>
<tr>
<td>CONTROL VALVES</td>
<td>DRESSER</td>
<td>8</td>
<td></td>
<td>3639</td>
<td>29112</td>
<td>29112</td>
</tr>
<tr>
<td>ON/OFF VALVES 1 1/2&quot; 150# RF</td>
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<td>16</td>
<td></td>
<td>2500</td>
<td>40000</td>
<td>40000</td>
</tr>
<tr>
<td>CONDENSATE TRAP</td>
<td>ARMSTRONG</td>
<td>8</td>
<td></td>
<td>500</td>
<td>4000</td>
<td>4000</td>
</tr>
<tr>
<td>ANALIZZATORE O2</td>
<td>METTLER-TOL.</td>
<td>8</td>
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<td>59200</td>
<td>59200</td>
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<td>PRESSURE INDICATOR</td>
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<td>32</td>
<td></td>
<td>90</td>
<td>2880</td>
<td>2880</td>
</tr>
<tr>
<td>MECHANICAL BULK MTL</td>
<td>VARI</td>
<td>8</td>
<td></td>
<td>6000</td>
<td>48000</td>
<td>48000</td>
</tr>
</tbody>
</table>
5.3.13.1 **ANALYSIS OF RELATIVE COST WITH RESPECT TO TOTAL COST**:

After inserting the data of Table 1 in ECIS preventive “cost estimation software” we have reached following conclusion of relative cost and relative work load with respect to total cost and work load.

**Table 1 (Material cost)**

<table>
<thead>
<tr>
<th>Material cost</th>
<th>RD</th>
<th>8</th>
<th>6000</th>
<th>48000</th>
<th>48000</th>
</tr>
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<tbody>
<tr>
<td>TUBI FLESSIBILI</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ING. MECCANICA</td>
<td>ECIS GROUP</td>
<td>600</td>
<td>26</td>
<td>15600</td>
<td>15600</td>
</tr>
<tr>
<td>ING. ELE/STRU</td>
<td>ECIS GROUP</td>
<td>600</td>
<td>28</td>
<td>16800</td>
<td>16800</td>
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<tr>
<td>GEST. COMM. PM</td>
<td>ECIS GROUP</td>
<td>1800</td>
<td>28</td>
<td>50400</td>
<td>50400</td>
</tr>
<tr>
<td><strong>Final total</strong></td>
<td></td>
<td></td>
<td></td>
<td>399,720</td>
<td>399,720</td>
</tr>
</tbody>
</table>

**Table 2 (Mechanical Part)**

Table *mechanical part* above shows that 56.33% of the total job is related to mechanical parts. 56.33% of that total cost is involved in mechanical engineering which includes the cost of raw material (pumps, compressors, and control valves) and cost involve in engineering activity.
**TABLE 3 (Electrical Part)**

Table Electrical part above shows that 15.15% of the total project is consumed by Electrical parts including cables, and electrical bulk material. Electrical parts are 15.15% of the total project cost.

**TABLE 4 (Instrumentation part)**

Table Instrumentation part above shows that instrumentation parts are 13.46% of the total project, instrumentation parts include pressure gauges, meter gauges, flow meter and other measurement devices.
TABLE 5 (Manpower)

Table Manpower above shows that 6.66% of the total job activities are by manpower including number of people use in assembly of skid, number of people used in job site.

TABLE 6 (Engineering)

Table Engineering above shows that 2.41% of the total job is consumed in engineering phase including analysis of process, analysis of engineering (mechanical, electrical, instrumentation) for the realization of skid.

On bases of above mentioned information related to the cost of raw material, cost involve in different activities and relative % of job with respect to total job helped the company to quote a final price of skid to client.
5.4 SUPPLIER EVALUATION:

The purpose of the project is to construct skids for the filtration of nitrogen. For the construction we need material such as Pumps, Compressor, heat exchangers, reservoirs, fittings, valves, electrical and mechanical bulk material one of the example of mechanical bulk material is Flange. Flange is a mechanical part used for connecting tubes, control valves with other parts.

Material specification Table No 7 shows the specification of a flange in terms of size, welding type, pressure rating, and material type.
5.4.1 SUPPLIER SELECTION: We have evaluated suppliers to get the material on best quality, time and cost standards, below mentioned excel show the evaluation of supplier on bases of cost. In our project company evaluated three suppliers. After economic calculation we have found that supplier metalforch is more economical than other suppliers

Following table shows the detail of three suppliers on bases of cost:

<table>
<thead>
<tr>
<th>TYPE</th>
<th>METALFAR</th>
<th>Maassflange</th>
<th>METALFORCH</th>
<th>FIL-PEMTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD</td>
<td>€ cad.</td>
<td>€ Tot.</td>
<td>€ cad.</td>
<td>€ Tot.</td>
</tr>
<tr>
<td>EUR</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>THREADED NPT-F NA</td>
<td>9.24</td>
<td>498.96</td>
<td>18</td>
<td>972</td>
</tr>
<tr>
<td></td>
<td>11.42</td>
<td>159.88</td>
<td>20</td>
<td>280</td>
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<tr>
<td></td>
<td>18.3</td>
<td>128.10</td>
<td>28</td>
<td>196</td>
</tr>
<tr>
<td></td>
<td>16.68</td>
<td>600.48</td>
<td>28</td>
<td>1008</td>
</tr>
<tr>
<td></td>
<td>24.06</td>
<td>337.26</td>
<td>43</td>
<td>602</td>
</tr>
<tr>
<td></td>
<td>42.08</td>
<td>1,599.04</td>
<td>66</td>
<td>2508</td>
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<td></td>
<td>46.5</td>
<td>93.00</td>
<td>74</td>
<td>148</td>
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<tr>
<td>WELDING NECK M</td>
<td>10.07</td>
<td>271.89</td>
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<tr>
<td></td>
<td>13.61</td>
<td>762.16</td>
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<td>1176</td>
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<tr>
<td>WELDING NECK M</td>
<td>21.11</td>
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<td>33</td>
<td>957</td>
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<tr>
<td></td>
<td>31.93</td>
<td>127.72</td>
<td>59</td>
<td>236</td>
</tr>
<tr>
<td>WELDING NECK M</td>
<td>28.96</td>
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<td>36.25</td>
<td>435.00</td>
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<td>804</td>
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<td></td>
<td>48.51</td>
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<td>10880</td>
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<td></td>
<td>69.47</td>
<td>138.94</td>
<td>114</td>
<td>228</td>
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<tr>
<td></td>
<td>68.93</td>
<td>10,339.50</td>
<td>102</td>
<td>15300</td>
</tr>
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<td></td>
<td>75.82</td>
<td>454.92</td>
<td>102</td>
<td>612</td>
</tr>
<tr>
<td></td>
<td>110.54</td>
<td>1,105.40</td>
<td>176</td>
<td>1760</td>
</tr>
<tr>
<td></td>
<td>122.5</td>
<td>122.50</td>
<td>176</td>
<td>1760</td>
</tr>
<tr>
<td></td>
<td>198.58</td>
<td>1,588.64</td>
<td>245</td>
<td>1960</td>
</tr>
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<td></td>
<td>380.06</td>
<td>380.06</td>
<td>416</td>
<td>416</td>
</tr>
<tr>
<td>BLIND NA</td>
<td>8.17</td>
<td>661.77</td>
<td>18</td>
<td>1458</td>
</tr>
<tr>
<td></td>
<td>10.26</td>
<td>184.68</td>
<td>20</td>
<td>360</td>
</tr>
</tbody>
</table>

NOTE: 1. SAUDI ARAMCO MATERIAL
Not shown: 30,644.31 Tot. 91,605.00 Tot. 45297 Tot. 57808

TABLE 8 (Supplier Evaluation on cost bases)

5.5 PROJECT ACTIVITY PLANNING: Below attached Activity planning Gantt shows the start and finish time of the activities involve in following project planning phases

1) Purchase order (PO) kick off meeting and the approval of purchase order
2) Engineering phase
3) Purchasing and procurement phase
4) Package construction and assembly
5) Final documentation
FIGURE 3 (Activity Planning Gantt chart)
5.5.1 EXPLANATION OF ACTIVITY PLANNING IN GANTT CHART:

5.5.1.2 Purchase order revision: Once we got purchase order from the client we have revised all supporting documents, contract documents, financial condition documents. Purchase order activity was planned on 30 June 2012 and took one day. In the Gantt this activity has two successors activates first is instrument and electrical engineering and second is purchasing & material receiving.

P.O REVISION (1 Day)

- INSTRUMENT AND ELECTICAL ENGINEERING (20 days)
- PURCHASING & MATERIAL RECEIVING (135 days)

5.5.1.3 Engineering phase: Engineering phase consists of Piping and instrumentation diagram, layout revision, equipment datasheet revision, general arrangement, isometric drawing, baseplate and supporting drawing and instrument and electrical engineering. Engineering phase starts from 23/02/12 and finish 05/09/2012 (129 days).

Diagram below shows successor and predecessor activities and their time duration in engineering phase.

23/02/12  

Layout revision (4 days)  

General agreement (10 days)

- Isometric drawing (15 days)
  - Baseplate drawing (10 days)

- Electrical Engineering (20 days)

05/09/12
5.5.1.4 Purchasing and material receiving: Purchasing and material receiving is one of the most time consuming activity in EPC projects, activity is consists of purchasing of raw material, equipment’s, mechanical and electrical bulk material, fittings, junction boxes and pressure vessels, for nitrogen generation skid we ordered electrical heaters and control panels, filters, nitrogen membrane, control valves, pressure safety valves (PSV), bell valves and pneumatic actuators, gate and check valves, mass flow meter, rot meter, mechanical bulk and instrument and electrical material.

Following figure below shows the time consumed in purchasing of material and equipment’s.

(08/06/12) Purchasing and material received (135 days) (04/01/13)

Electrical heater and control panel (105 days) (14/11/12)

(18/06/12) Filters (95 days) (08/11/12)

(25/06/12) Nitrogen membrane (90 days)

Control valves (110 days) (06/12/12)

(29/06/12) Pressure safety valve (120 days)

5.5.1.5 Packaging construction and assembly: Once major numbers of equipment’s and material are received ECIS group sent the request for construction, for example filters, pressure valves, gate check valves will be received later, however construction activity starts early. Construction of base plate is a predecessor activity to start construction.

Figure below in next page shows all predecessor and successor activities and time consumption by each activity in assembly phase.
Steel structure (15 days) 22/10/12

Painting structure (10 days) 07/11/12

30/10/12 Piping fabrication (16 days) 22/11/12

14/11/12 Skid pre assembly (6 days)

Insulation

NTD Hydraulic testing

Piping and skid connection

Electrical connection

Insulation

Painting

**Time duration Calculation:** After analyzing all activities in different phases in Activity planning Gantt showed that it will take approximate **252 days** to complete the project in case of most optimistic time
5.6 ECONOMIC PROGRESS CURVE: During different phases of project cash received from the client, money paid to suppliers, bank installment paid and total net cash balance in company is shown by the attached excel sheet

<table>
<thead>
<tr>
<th>Date</th>
<th>Received + Back log</th>
<th>Paid</th>
<th>Delta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/15/2012</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2/15/2012</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3/14/2012</td>
<td>1791000.00</td>
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<td>1791000.00</td>
</tr>
<tr>
<td>4/11/2012</td>
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<td>4/8/2013</td>
<td>1337180.00</td>
<td>90000.00</td>
<td>1247180.00</td>
</tr>
</tbody>
</table>

**TABLE 9 (Cash inflow /Outflow)**

Table cash inflow /outflow above shows the cash received by the company, cash paid to the supplier and net balance remained in company after every transaction. Representation of cash flow table is shown below by economic progress curve
FIGURE 4 (Economic progress curve)
5.6.1 EXPLANATION OF ECONOMIC PROGRESS CURVE:

In the above traced figure for each transaction there are three histograms representing cash inflow, cash out flow and net balance remain inside the company in the end of each transaction. As we see in the beginning of the project cash transaction is low and thereafter it’s in increasing order

The economic progress curve helped project manager to understand the economic status of the project, curve is traced in MS excel, for example company need to receive a certain payment from a client but due to some reason payment is delayed in this case we will just assign zero in above excel in place of cash inflow and will see how progress curve changed its shape.

Information based on economic curve helped company to reschedule project activities in a more correct and systemic way, it also helps to make a correct communication with external financial entities in case of unexpected situations.

**Note:** In economic progress curve information is described as follows

- X axis shows the date and months of transaction
- Y axis shows the amount of transaction in euros
- Red color histogram shows cash inflow ( + Positive )
- Black color histogram shows cash out flow ( - Negative)
- Green color histogram shows net cash balance for each transaction (delta)
CHAPTER 6

6. RESEARCH & DEVELOPMENT FOR THE SCOPE OF IMPROVEMENT:

The strategic objective of ECISGROUP is to maximize the merger of the three companies group in a single organization with the aim of structuring the resources uniquely and synergistically in order to provide the market with the role of EPC contractor.

The scope of research is to understand the organizational overall problematic areas and their weakness within the company. Personal interview was conducted with 18 managers and identified total 73 problems in ECIS Group. Questioners was divided in to following segments
1) Organization structure
2) Procedures /operation
3) Implementation of Information technology (IT)
4) Formazione (Training)
5) Talent Retention and others

6.1 METHODOLOGY OF DATA COLLECTION:

6.1.1 ORIGINAL INFORMATION:

We have analyzed all information inside the company; we have gone through all project reports and internal documents done by the company in past 10 years

6.1.2 SECONDERY INFORMATION:

Some second hand information contributes to our project. For example, we read related articles and books about the EPC projects; we have read case studies done by expert in EPC projects and consulted research done by ABB Company

6.1.3 METHODOLOGY OF DATA ANALYSIS:

The empirical data was collected through interviews. In order to find out the problems in ECIS Group, face to face interviews was conducted with 18 managers and company CEO. The interviews used in this research were semi-structured. Semi-structural interviews are useful if the researcher has a clear theoretical understanding of the topic, which allows the researcher to create an appropriate questionnaire. Semi-structured interview means that there is some flexibility in the wording and order of the questions. The script of the interview is not preplanned and the order of the questions can vary, the interviewer can also ask for examples and so on to get more detailed answers. The major advantage of semi-structured interviews is that the materials are somewhat systematic and comprehensive, while the tone of the interview is fairly conversational and informal. (Questioners is attached in appendix)
### 6.2 DEVELOPMENT OF ORGANIZATION SEGMENTS AND THEIR PROBLEMS

<table>
<thead>
<tr>
<th>ORGANIZATION's SEGMENTS</th>
<th>AREA OF PROBLEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRUTTURA ORGANIZZATIVA (ORGANIZATION STRUCTURE)</td>
<td>- LIVELLI DI DELEGA</td>
</tr>
<tr>
<td></td>
<td>- RISORSE SOTTOUTILIZZATE</td>
</tr>
<tr>
<td></td>
<td>- RUOLI E RESPONSABILITA'</td>
</tr>
<tr>
<td></td>
<td>- DIMENSIONAMENTO RISORSE</td>
</tr>
<tr>
<td></td>
<td>- STRUTTURA COMMERCIALE</td>
</tr>
<tr>
<td></td>
<td>- FILTERING TECNICO OFFERTE</td>
</tr>
<tr>
<td></td>
<td>- CONOSCENZA E CONDIVISIONE OBIETTIVI</td>
</tr>
<tr>
<td></td>
<td>- SBILANCIAMENTO KNOWLDEGE RISORSE (PROFILI SENIOR CONSULENTI, PROFILI JUNIOR DIPENDENTI)</td>
</tr>
<tr>
<td></td>
<td>- IMMAGINE AZIENDALE DA SVILUPPARE</td>
</tr>
<tr>
<td>PROCEDURE / PROCESS OPERATIVI (PROCÉURES)</td>
<td>- EFFICIENZA / EFFICACIA DEI FLUSSI DI LAVORO CODIFICATI</td>
</tr>
<tr>
<td></td>
<td>- KNOWLEDGE MANAGEMENT</td>
</tr>
<tr>
<td></td>
<td>- PROJECT MANAGEMENT</td>
</tr>
<tr>
<td></td>
<td>- SISTEMA DI CODIFICA DEI MATERIALI</td>
</tr>
<tr>
<td></td>
<td>- REPERIMENTO DOCUMENTAZION</td>
</tr>
<tr>
<td></td>
<td>- SINERGIE INTERDIPARTIMENTALI</td>
</tr>
<tr>
<td>INFORMATION TECHNOLOGY (IT)</td>
<td>- CARENZE IT – GAMMA</td>
</tr>
<tr>
<td></td>
<td>- CARENZE IT - PDM / SOLID WORKS</td>
</tr>
<tr>
<td>FORMAZIONE (TRAINING)</td>
<td>FORMAZIONE TECNICA</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td></td>
<td>FORMAZIONE IT</td>
</tr>
<tr>
<td></td>
<td>SENSIBILIZZAZIONE A TRASFERIMENTO E FORMALIZZAZIONE ESPERIENZA</td>
</tr>
<tr>
<td></td>
<td>CARENZE DI CARATTERE TECNICO /PROGETTUALE E GESTIONALE</td>
</tr>
</tbody>
</table>

| TALENT RETENTION (HUMAN RESOURCE) | TALENT RETENTION |

| OTHERS | OTHER (GEST. FORNITORI / AUTOFINANZ. DI COMMESSA) |

**TABLE 10: Segmentation of critical issues identified for the interviews**
6.2.1 ORGANIZATION’s SEGMENTS AND PROBLEMS BY (INTERVIEW) :

18 People were interviewed and asked “please say yes” if they agree with questions. Below is the table that shows the total number of problems in each segment and the total number of overall problems agreed during the interview by the company’s employees.

<table>
<thead>
<tr>
<th>SEGMENTS (SEGMENTS)</th>
<th>AREA OF PROBLEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRUTTURA ORGANIZZATIVA (ORGANIZATION STRUCTURE)</td>
<td>- LIVELLI DI DELEGA (8)</td>
</tr>
<tr>
<td></td>
<td>- RISORSE SOTTOUTILIZZATE (4)</td>
</tr>
<tr>
<td></td>
<td>- RUOLI E RESPONSABILITA' (4)</td>
</tr>
<tr>
<td></td>
<td>- DIMENSIONAMENTO RISORSE (3)</td>
</tr>
<tr>
<td></td>
<td>- STRUTTURA COMMERCIALE (2)</td>
</tr>
<tr>
<td></td>
<td>- FILTERING TECNICO OFFERTE (2)</td>
</tr>
<tr>
<td></td>
<td>- CONOSCENZA E CONDIVISIONE OBIETTIVI (1)</td>
</tr>
<tr>
<td></td>
<td>- SBILANCIAMENTO KNOWLDEGE RISORSE (PROFILI SENIOR CONSULENTI, PROFILI JUNIOR DIPENDENTI) (1)</td>
</tr>
<tr>
<td></td>
<td>IMMAGINE AZIENDALE DA SVILUPPARE (1)</td>
</tr>
</tbody>
</table>

| STRUTTURA ORGANIZZATIVA (TOTAL) | (26) |
| PROCEDURE/PROCESS OPERATIVI (PROCEDURES) | - EFFICIENZA / EFFICACIA DEI FLUSSI DI LAVORO CODIFICATI (11) |
|                     | - KNOWLEDGE MANAGEMENT (4) |
|                     | - PROJECT MANAGEMENT (3) |
|                     | - SISTEMA DI CODIFICA DEI MATERIALI (3) |
|                     | - REPERIMENTO DOCUMENTAZION (1) |
|                     | - SINERGIE INTERDIPARTIMENTALI (1) |

<p>| PROCEDURE PROCESSI OPERATIVI (Total) | (23) |</p>
<table>
<thead>
<tr>
<th>INFORMATION TECHNOLOGY (IT)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- CARENZE IT – GAMMA</td>
<td>(6)</td>
</tr>
<tr>
<td>- CARENZE IT - PDM / SOLID WORKS</td>
<td>(3)</td>
</tr>
<tr>
<td>- CARENZE IT - TOOLS DI SUPPORTO</td>
<td>(1)</td>
</tr>
</tbody>
</table>

| INFORMATION TECHNOLOGY (Total)                                                          | (10) |

<table>
<thead>
<tr>
<th>FORMAZIONE (TRAINING)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>- FORMAZIONE TECNICA</td>
<td>(3)</td>
</tr>
<tr>
<td>- FORMAZIONE IT</td>
<td>(3)</td>
</tr>
<tr>
<td>- SENSIBILIZZAZIONE A TRASFERIMENTO E FORMALIZZAZIONE ESPERIENZA</td>
<td>(1)</td>
</tr>
<tr>
<td>- CARENZE DI CARATTERE TECNICO / PROGETTUALE E GESTIONALE</td>
<td>(1)</td>
</tr>
</tbody>
</table>

| FORMAZIONE (Total)                                                                     | (8) |

<table>
<thead>
<tr>
<th>TALENT RETENTION (HUMAN RESOURCE)</th>
<th></th>
</tr>
</thead>
</table>

| TALENT RETENTION (Total)                                                               | (4) |

<table>
<thead>
<tr>
<th>OTHER</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OTHER (GEST. FORNITORI / AUTOFINANZ. DI COMMESSA)</td>
<td>(2)</td>
</tr>
</tbody>
</table>

| OTHER (total)                                                                          | (2) |

| TOTAL OF ALL SEGEMENTS                                                                  | (73) |

**TABLE 11 (Distribution of critical segments by Interview)**
6.2.1.1 SUMMARY OF ALL SEGMENTS:

<table>
<thead>
<tr>
<th>SEGMENT</th>
<th>TOTAL PROBLEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STRUTTURA ORGANIZZATIVA</td>
<td>26</td>
</tr>
<tr>
<td>PROCEDURE / PROCESSI OPERATIVI</td>
<td>23</td>
</tr>
<tr>
<td>IT</td>
<td>10</td>
</tr>
<tr>
<td>FORMAZIONE</td>
<td>8</td>
</tr>
<tr>
<td>TALENT RETENTION</td>
<td>4</td>
</tr>
<tr>
<td>OTHER</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL OF ALL SEGMENTS</strong></td>
<td><strong>73</strong></td>
</tr>
</tbody>
</table>

**TABLE 12 (Sum of all segments)**

6.2.1.2 GRAPHICAL FORM OF ALL SEGMENTS AND THEIR PROBLEMS:

Figure above shows the graphical representation of the total problem of each segment, as we see segment organization structure has maximum no of problems (26) thereafter procedure segment with (23), IT segment (10) formation segment (8) and talent retention segment with (4) problems.

- Total no of problems in Segments organization structure are 35.6% of the total problems
- Total no of the problems in segment procedure are 31.5 % of the total problems
- Total no of the problems in segment IT are 13.6 % of the total problems
- Total no of the problems in formazione segments are 10.95 % of the total problems
- Total no of the problems in talent retention are 5.4% of the total problems.

**TABLE 13 (No of problems in every segment in terms of %)**
6.2.1.3 GRAPHICAL FORM OF PROBLEMS IN ORGANIZATION SEGMENT:

After analyzing overall problems, we have deeply analyzed problem related to organization segment. Below attached histogram shows the problem related inside the organization structure segment.

Figure above shows the graphical representation of the total problem of organization structure segment, as we see segment organization structure has (26) problems out of total (8) problems are due to level of work delegation, (4) problems are due to roles and responsibilities, (4) problems are due to unused resources (3) problems are due to commercial structure (2) problems are due to lack of resources etc.

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of delegation</td>
<td>30.7%</td>
</tr>
<tr>
<td>Roles and responsibilities</td>
<td>15.3%</td>
</tr>
<tr>
<td>Unused resources</td>
<td>15.3%</td>
</tr>
<tr>
<td>Commercial structure</td>
<td>11.5%</td>
</tr>
<tr>
<td>Lack of resources</td>
<td>7.6%</td>
</tr>
</tbody>
</table>

**TABLE 14 (No of problems with in organization segment in terms of %)**
6.2.1.4 GRAPHICAL FORM OF PROBLEMS WITH IN PROCEDURE SEGMENT:

After analyzing overall problems, we have deeply analyzed problems with in procedure and operating process segment. Below attached histogram shows the problem related to procedure and operation process segment.

Figure above shows that there are total (23) problems related to procedure segment, out of the total problems (11) problems are due to work flow efficiency, (4) problems are due to project management, (3) problems are due to material coding, (3) problems are due to knowledge management etc.

<table>
<thead>
<tr>
<th>Procedure Segment</th>
<th>Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency in Work flows</td>
<td>11</td>
</tr>
<tr>
<td>Project Management</td>
<td>4</td>
</tr>
<tr>
<td>Material Coding</td>
<td>3</td>
</tr>
<tr>
<td>Knowledge Management</td>
<td>3</td>
</tr>
<tr>
<td>Interdepartment Synergy</td>
<td>1</td>
</tr>
<tr>
<td>Reference Documentation</td>
<td>1</td>
</tr>
</tbody>
</table>

**TABLE 15** (No of problems with in procedure segment in terms of %)
6.2.1.5 GRAPHICAL FORM OF PROBLEMS WITH IN IT SEGMENT:

After analyzing overall problems, we have deeply analyzed problems with in Information Technology segment. Below attached histogram shows the problem related to IT segment

Figure above shows that there are total (10) problems related to Information Technology segment, out of total (6) problems are due to weakness of IT Gamma system, (3) problems are due to weakness of PDM/solid work and (1) problem is due to IT tools support

In IT segment 60% of the problems belongs to weakness of IT gamma system
In IT Segment 30% of the problems belongs to weakness of PDW /Solid work
In IT Segment 10 % of the problems belongs to the weakness of IT tools support

TABLE 16 (No of problems with in IT Segment in terms of %)
6.2.1.6 GRAPHICAL FORM OF PROBLEMS WITH IN FORMAZIONE SEGMENT:

After analyzing overall problems, we have deeply analyzed problems with in Formazione segment. Below attached histogram shows the problem related to Formazione segment.

Figure above shows that there are total (8) problem related to Formazione segment, out of total no of problems (3) problems are due to technical training, (3) problems are due to IT training etc. (2) Problems are due to others.

In Formazione segment 37.5 % of the problems belongs to technical training

In Formazione segment again 37.5 % of the problems belongs to IT training

TABLE 17 (No of problems with in Formazione Segment in terms of %)
6.3 ANALYSIS AND RESULTS:

Figures based on histograms we have analyzed different problems in ECIS group and suggested modification, below are the details explanation of analysis

6.3.1 FIGURE RELATED TO ORGANIZATION STRUCTURE SEGMENT:

1) Organization structure has 35.6% of the total over all (73) problems in organization
2) In organization structure 30.7% of the total (26) problem belongs to level of delegation

6.3.1.1 ANALYSIS:

We have found that there is a problem in organization structure due to mainly few factors

1. ECIS group is the integration of three disjoint companies, instrumentation, engineering and construction

2. EPC projects are unique in nature which need unique technical and project management skills for different projects

3. These problems create inefficiency in EPC projects in terms of unbalanced workloads, Bottlenecks in department operation, No full use of skills, and unclear definition of roles and responsibilities in levels of operating mandate

4. In a nutshell, a modern and efficient organizational structure devoted to design, management and implementation of EPC projects is missing.

6.3.2 SUGGESTION:

1. Interview shows that organization structure is flat; in order to be efficient company need to form hierarchy where roles and responsibilities should be delegated downward to departmental heads from the top management and from departmental head to managers, at the same time there should be constant control from the top to bottom

2. Methods of monitoring by the top management on the progress of the projects, which will be periodic but systematic (review bimonthly).

3. Systems / review procedures that must be systematically carried out and implemented to enhance the culture of technical / management, sharing and commitment to the pursuit of result
6.3.3 FIGURE RELATED TO OPERATING PROCESS SEGMENT:

1) Procedure and operating process segment has 31.5 % of the total (73) problems in organization
2) In procedure and operating process segment 47.82 % of the (23) problems belongs to efficiency in work flow

6.3.3.1 ANALYSIS AND SUGGESTION:

The procedures must be developed and shared in relation to the processes Qualification with potential customers. In general:

1. Processing cycle of tenders
2. Project management, from planning to control
3. Methods, tools and responsibilities of Project Control
4. The cycle of Engineering
5. The control cycle time / quality of the materials
6. Work Instructions (ILA) of the individual units.
7. The role of positions typically commercial (proposal) must be more precisely defined also in relation to interfaces with the engineering function. Commercial manager should be knowledgeable about the technical aspect of the project while making negotiation with client.
6.3.4 FIGURE RELATED TO IT SUPPORTS SEGMENT:

1) IT Support segment has **13.7%** of the total (73) problems in organization
2) In IT support segment **60%** of the total (10) problems are due to weakness of IT Gamma system

6.3.4.1 **IT AT MANAGEMENT LEVEL:**

**Gamma Team system:** Enterprise Resource Planning) system is needed to design and manage information and documents registry, the commercial process, the production process (projects, WBS, activities, hours paid employees) and corporate management.

6.3.4.2 **IT AT OPERATION LEVEL:**

**New MS Project:** Project planning software is needed which would be used for the management of resources, monitoring of activities, time, and cost.

**New AutoCAD:** Application for mechanical design (three-dimensional).

**Solid Works / PDM (in development):** Three-dimensional design software (Solid Works), with direct interface with the Product Data Management (PDM) for the management integrated information and project documents (repository for structured documents design, certificates, inspections, etc.)
6.3.5 FIGURE RELATED TO TRAINING AND TALENT RETENTION SEGMENT:

Resource training and talent retention is 5.4 % of the total (73) problems in organization

ANALYSIS AND SUGGESTION:

1. Interview shows that Resources are numerically scarce in relation to the objectives of society; there are deficiencies in the areas of process, project management, engineering (plant, pressure vessels and machines).

2. In particular seems to lack a specific reference to the Project Management (men and equipment) capable of managing EPC projects. ECIS Group Need to make investment in resources, training and education
CHAPTER 7

7. CONCLUSION: After analyzing all segments and their respective problem we have found that there were total 73 problems in which 26 problems are belong to organizational segments, 23 problems belongs to procedure segment, 10 belongs to IT segments and 8 belongs to training segments, we also analyzed each segment and highlighted problem who score maximum point in each segment.

Below table shows the list/name of problems that scored maximum points in their respective segments.

<table>
<thead>
<tr>
<th>SEGMENT</th>
<th>HIGHTEST/ BIGGEST PROBLEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORGANIZATION SEGMENT</td>
<td>LEVEL OF DELIGATION 30.70%</td>
</tr>
<tr>
<td>PROCEDURE SEGMENT</td>
<td>WORK FLOW INEFFICIENCY 47.82%</td>
</tr>
<tr>
<td>IT SEGMENT</td>
<td>WEEKNESS IN IT 60%</td>
</tr>
<tr>
<td>FORMAZIONE SEGMENT</td>
<td>TECHNICAL TRAINING 37.50%</td>
</tr>
</tbody>
</table>

In nut shell we can conclude that however company need to work on all problematic segments and their respective problems but in general company may put their first effort to resolve the problems in terms of “Level of delegation, work flow inefficiency, weakness in IT system and technical training”

FIGURE: 5 (Pi chart showing all major problems with in ECIS Group)

It is important to remark that it is not a task for the trainee to point out or find solution of the problems but the purpose of research was “just problem identification/problem highlight and generic analysis.”
APPENDIX 1 (Purchase order)
TECHNICAL AND COMMERCIAL OFFER

PRICED

CUSTOMER
Samsung Engineering Co. Ltd

FINAL CLIENT
Saudi Aramco

OFFER N°
11-0733-2P rev. 1 (HAZOP Requirements)

PROJECT
Shaybah Increase Gas Handling Capacity

RFQ N°
SG2419

SUPPLY
N2 Generation PKG

COUNTRY
Saudi Arabia

DESTINATION
SAM SUNG ENGINEERING CO.
Samsung SEI Tower, 457-14 Doggw-2 Dong
Gangnam-Gu, Korea 135-686

SUPPLIER ADDRESS
ECIGROUP s.p.A.
Headquarters: Via Pavia, 21 - 20036 Muggio (MB), Italy
Tel. +39 039 2768.1 - Fax +39 039 2761393 - E-mail: seco@ecigroup.it
Registered Office: Via Quinini, 12 - 22100 Como (CO), Italy

APPENDIX 2 (Request for quotation)
APPENDIX 3 (Symbols used in process industry)
APPENDIX 4 (Piping & Instrumentation diagram)

Preliminary Piping and Instrumentation Diagram for T-101
APPENDIX 5 (SKID)
MECHANICAL AND ELECTRICAL BULK MATERIAL, CONTROL VALVES, HEAT EXCHANGER, PUMPS, TURBINE:

(VALVE)

(HEAT EXCHANGER)

(PRESSURE VASSELS)

(PUMP /COMPRESSOR )

(GAS TURBINE)

APPENDIX 6
## APPENDIX 7 (INTERVIEW PERSONALS LIST)

<table>
<thead>
<tr>
<th>RISORSA</th>
<th>RUOLO</th>
<th>BU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D. Branda</td>
<td>Supply Chain</td>
</tr>
<tr>
<td>2</td>
<td>S. Zecchi</td>
<td>BU3 Engineering</td>
</tr>
<tr>
<td>3</td>
<td>M. Delmiglio</td>
<td>Finance</td>
</tr>
<tr>
<td>4</td>
<td>G. Ferri</td>
<td>BU2 Water Treatment</td>
</tr>
<tr>
<td>5</td>
<td>C. Boeru</td>
<td>BU2 WHCP</td>
</tr>
<tr>
<td>6</td>
<td>C. Redaelli</td>
<td>Supply Chain</td>
</tr>
<tr>
<td>7</td>
<td>S. Chiricò</td>
<td>BU2 WHCP</td>
</tr>
<tr>
<td>8</td>
<td>F. Padovan</td>
<td>Staff</td>
</tr>
<tr>
<td>9</td>
<td>C. Lebrun</td>
<td>BU3 Automation</td>
</tr>
<tr>
<td>10</td>
<td>M. Delmiglio</td>
<td>Finance</td>
</tr>
<tr>
<td>11</td>
<td>L. Ferrè</td>
<td>BU3 Automation</td>
</tr>
<tr>
<td>12</td>
<td>S. Crippa</td>
<td>BU2 Skid &amp; Packages</td>
</tr>
<tr>
<td>13</td>
<td>R. Ibrahim</td>
<td>BU2 Service / Spare Parts</td>
</tr>
<tr>
<td>14</td>
<td>A. Fantò</td>
<td>BU3 Engineering</td>
</tr>
<tr>
<td>15</td>
<td>G. Del Forno</td>
<td>BU2 Skid &amp; Packages</td>
</tr>
<tr>
<td>16</td>
<td>G. Falliti</td>
<td>Workshop</td>
</tr>
<tr>
<td>17</td>
<td>E. Cerutti</td>
<td>BU2 Operation</td>
</tr>
<tr>
<td>18</td>
<td>G. Pesenti</td>
<td>Sales and Marketing</td>
</tr>
<tr>
<td>19</td>
<td>E. Cerutti</td>
<td>BU2 Operation</td>
</tr>
</tbody>
</table>

- Intervista & Report
- Intervista
| QN: Tell us something about your roles and responsibilities. Are you happy about it? If no why? |
| QN: Tell us something about job delegation in different EPC project |
| QN: In ECIS Group how resources are utilize, are resources not fully saturated? |
| QN: Are you happy about Commercial structure of the company, if not why? |
| QN: Do you think there is a problem in project management procedures? |
| QN: Do you think in the company Knowledge management and Knowledge sharing is done well? |
| QN: Are you happy about IT tools used in the company? |
| QN: Are you happy about technical training provided by the company to employees? |
| QN: Are you happy about IT training provided by the company to employees? |
| QN: How young graduates are trained in ECIS Group, does company invest in their training? |

**APPENDIX 8 (INTERVIEW QUESTIONERS)**
Figure 1. Oil and gas production overview

APPENDIX 9 (Process Flow connection)
9. REFERENCES:

- www.ecisgroup.it
- www.wikipedia.org
- www.abb.com
- www.ge.com
- www.stateoil.com
- www.astom.com
- www.google.com
- Quality manual ECIS Group
- Engineering manual ECIS Group
- Procurement Manual ECIS Group
- Construction Manual ECIS Group
- Thesis on EPC contracting by NITSingapour
- Document on EPC Contraction by ABB
- Automation manual by ECIS group
- Thesis on EPC project management
- Book on “General description on oil &Gas sector by ABB
- Communication with ECIS group’s Managers and employees
- Google articles on EPC contracting
- Face to face discussion with EPC project manager and Procurement manager

THE END