

Introduction

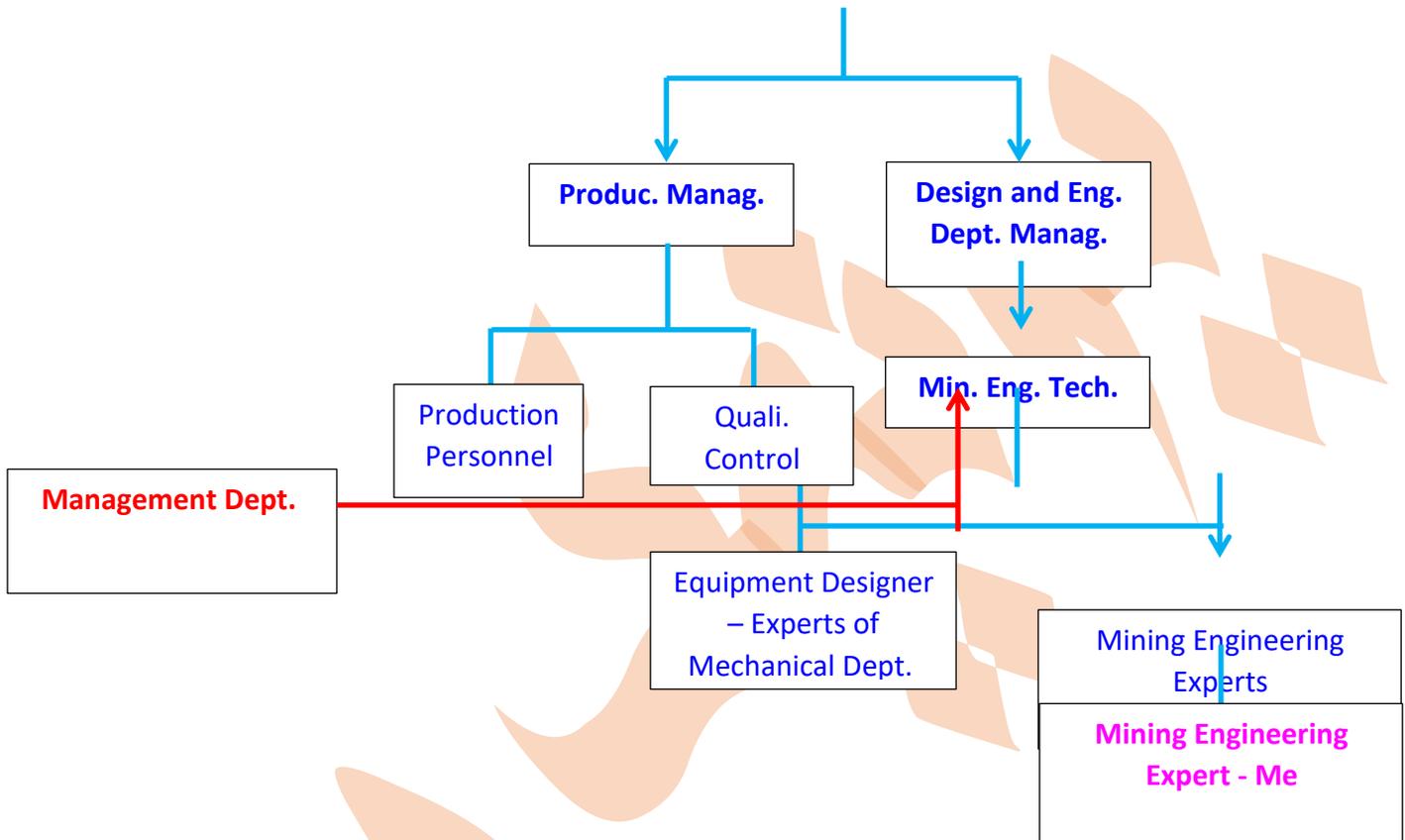
3. 1. I worked for //////////////// located in //////////////// The project is design and manufacture of autogenous mill. The client of the work was ////////////////. The project site was ////////////////e. the project total duration was 5 months and I worked the same time. Project started in Oct. 20///// And completed Feb. 20///// I was mining engineering technologist and I did studies, collected information regarding copper mineral physical properties and different methods of processing and grinding of it to achieve the considered grading of output load and I selected the type of mill and monitored on design and manufacture of mill.

Background

3. 2. In this project, I collected information about grading and physical properties of the mineral as well as output load grading. I performed precise computation for input and output load required and studied physical and chemical properties of the mineral. I selected average mill to achieve the considered output with the best performance efficiency. After the contract was finalized between the client and my company, I was assigned to the project as mining engineering technologist; I collected the mineral physical and chemical properties and selected the appropriate mill for grinding operations and monitored on design and manufacture as well as performance test.

3. 3. The objective from this project was selection, design, make and test of performance for a copper mine rock grinding machine to achieve the output load grinding with the considered dimensions in the plant.

3. 4. The organizational chart of the project is as following:



Personal Engineering Activity

3. 5. After the project contract, my position was identified; I was assigned in the project by project manager. I collected required information through different methods. I made visits to the /// processing plant and collected information about physical properties and grading requirements. I analyzed mineral mill models in industrial scale. I collected pertinent information and after several meetings that I had with management of project and experts, I opted for best method and mill.

- 3.6. After wide researches and comparison of different methods in grinding minerals and considering physical structure and required grading of mill, I opted for Autogenous mill for processing copper. I calculated required power for mill to grind copper minerals with maximum efficiency performance and least consumption of energy. I used different formulas and compared them with similar projects conducted before and accordingly I selected required electromotors considering rpm and power.
- 3.7. In order to solve these two issues, first in the way of mineral processing, I had to follow either wet or dry method in which If I opted for dry method, I had to consume a lot of energy in the beginning to reduce humidity of raw materials and also make required prediction to prevent spread of dust which I considered not economic. Then I followed wet method which had more advantages in this stage of processing minerals. Second step was selecting type of mill since considering variety of mills such as rod mill, ball mill, tube mill, pebble mill, autogenous mill, vibrating mill, vert mill, roller mill, hammer mill, jet pulveriser mill and other ones, I chose autogenous mill considering volume of primary investment and secondary costs as well as low maintenance costs in addition to higher efficiency. To solve this problem, I collected information and performed similar tests using an old mill to make sure that I made a proper choice.
- 3.8. In the beginning of this problem, first I used information collection using library method to extract information and data from internal resources, papers and university thesis. Then I used field visit method to collect other information as required from the site and inspected the physical structure and grading of final product required by processing system. I took into consideration barriers and limitation existing in the project.
- 3.9. This step of my engineering activities had a direct relationship with one very critical issue globally and it was energy consumption. Considering that today optimized consumption of energy is an important issue for the humanity, selecting best type of mill with higher efficiency and lower energy consumption was one of major issue in this project. Through accurate design and proper inspection I could achieve this important factor.
- 3.10. In this project, I had several internal meetings with project members including mineral processing experts and engineers as well as mechanical engineers' experts and mine equipment design and project management. I had regular meetings with other professionals from other disciplines and mine processing plant authorities. I had good deal of communication and interaction with them in different aspects of the mine issues and problems to select type of mill and physical and mechanical properties of it.

3. 11. During the project and this step of activities, I had daily and weekly internal meetings with project members including mineral processing experts and mechanical engineers under project management leadership. I controlled some job descriptions and I also controlled project progress together in the meeting and considered probable and current issues at the project.
3. 12. Throughout the project, I followed related standards to the mineral processing and mechanical engineering to design and make mineral equipment. I gained valuable information through consulting to traffic equipment quality control experts as well as mechanical engineers. I applied advises in their expertise. Regarding material quality check, I controlled some raw materials such as steel shafts and plate quality for installation inside mill and prevention of minerals collapse inside autogenous mill. We applied dust resistant electromotors in mills. I took some samples from raw materials and sent it to metallurgy research center; they verified the physical and chemical properties accuracy.
3. 13. During the project, regarding the issues about time and cost management, I had good co-work with project manager in cooperation to research team members. We had meetings together and I used MS Project software for this purpose. I took into consideration that this mill is a rotating equipment of large size and has various safety concerns. I studied the raw materials, tested them, and did computer modelling of the machine using stability analysis software and industrial machineries resistance and made sure of the machine safety.
3. 14. I calculated the autogenous rpm in a way that relative speed of falling load on the mill be the maximum so that if the mill speed exceeds critical limit, there was a stop. During the project, all project experts and managers verified accuracy of works done and calculations in their reports. We discussed the issues in weekly meetings about quality control.
3. 15. Considering that majority of resources were English, I tried to study various papers on the internet and references books in this regard, I tried to find the best solutions to perform my job description in the best manner. I tried to apply my competencies in communication with team experts and performing the works in a team manner. I used the other opinions and I learnt their knowledge. I was open to criticism and accepted my mistakes and tried to improve myself.
3. 16. Project manager defined job description for the experts; and sent emails in joint meetings through emails, he sent reports to the members. I was in close relationship with mineral processing experts and mechanical engineers to achieve the best milling performance efficiency. By reading different papers in English and Farsi, I tried to use the latest technologies and researches in milling equipment and mineral processing.

3. 17. Calculating mill required power was a critical and important issue requiring accuracy and care. After inspections and studying different resources, I opted for the best method in calculating autogenous power calculation method using the following method:
3. 18. I applied ////////////// Processing Handbook – 2010, PENDELTON – Fluid energy milling – 1998, WEISS – Mineral Processing Handbook – Society of Mining Engineers – 1985; I studied different articles from the Internet. I used MS Office software to prepare reports and tables for drawing diagrams. I used AutoCAD and SOLID Works to design drawings for autogenous mill. Solving this issue, I drew the electromotors performance curve and analyzed best performance point to selected the most suitable electromotor.
3. 19. For solving problems, I used library research method in studying resources and papers worldwide. I used field research method to study the mill consumption power and applicable solution with least costs for troubleshooting. I saved costs and cared about time and cost management as a mining engineering technologist. Considering that calculating mill proper power and as a result selection and supplying proper electromotor had significant impact in reducing energy consumption, I tried my best to have a special look on optimization of energy consumption in this project so that I could reduce energy consumption to the least.
3. 20. For troubleshooting purposes, I worked closely with //////////////// mechanical engineering and mineral processing departments and I applied //////////////// mineral processing department. I applied their experiences and opinions during the project; I learnt valuable experience and during the project I used them.
3. 21. Considering the fact that rotation of two parts of autogenous mill on reverse manner had significant importance and also reverse rotation mechanisms as common in industry is highly expensive and in some cases even inapplicable and has higher costs of commissioning and maintenance being vulnerable equipment in which in highly polluted areas such as mineral environments would result in performance problems, I suggested using separate electromotors for each parts and also not increasing consumption power by this method so that I could have an innovation in solving this problem. I applied pertinent standards in minerals milling and other design standards as well as rotating mechanical equipment standards in addition to energy consumption optimization standard as applied in Iran ministry of mines and commerce.

Summary

3. 22. This project was a successful one cause with minimum costs we could achieve the best result either from performance point of view or client needs satisfaction. Moreover, we could achieve low energy consumption factor. The project completed about a month earlier than estimated completion time which was another positive point and success for project.
3. 23. I earned valuable experiences both technically and personally. I improved my mining engineering knowledge in the filed of minerals processing and teamwork cause throughout project I communicated to large number of experts and specialists from different background of experiences. I learnt teamwork is a key for sustainable learning. I tried to face inevitable situations and challenge insoluble problems. I did not stop and did not get disappointed. I relied on my knowledge, I searched in reliable international resources and consulted and applied experts' experiences so that I could solve problems in the minimum time possible. I made project management happy at the end of project.

Introduction

2. 1. I worked for located in The project is designing mine ventilation system and manufacturing an anti-explosion fan to ventilate explosive gases and dilution of gas in The project site; the client The contractor of the project The total duration of project is 4 months. Started October 20..... to Jan. 2..... was the time that project finished. As mining engineering technologist, I was responsible for studies and collection of information as required for the gases and explosive materials in /////////////// air and evaluation of required air in tunnels and mine shafts; and selecting type proper fan for air ventilation.

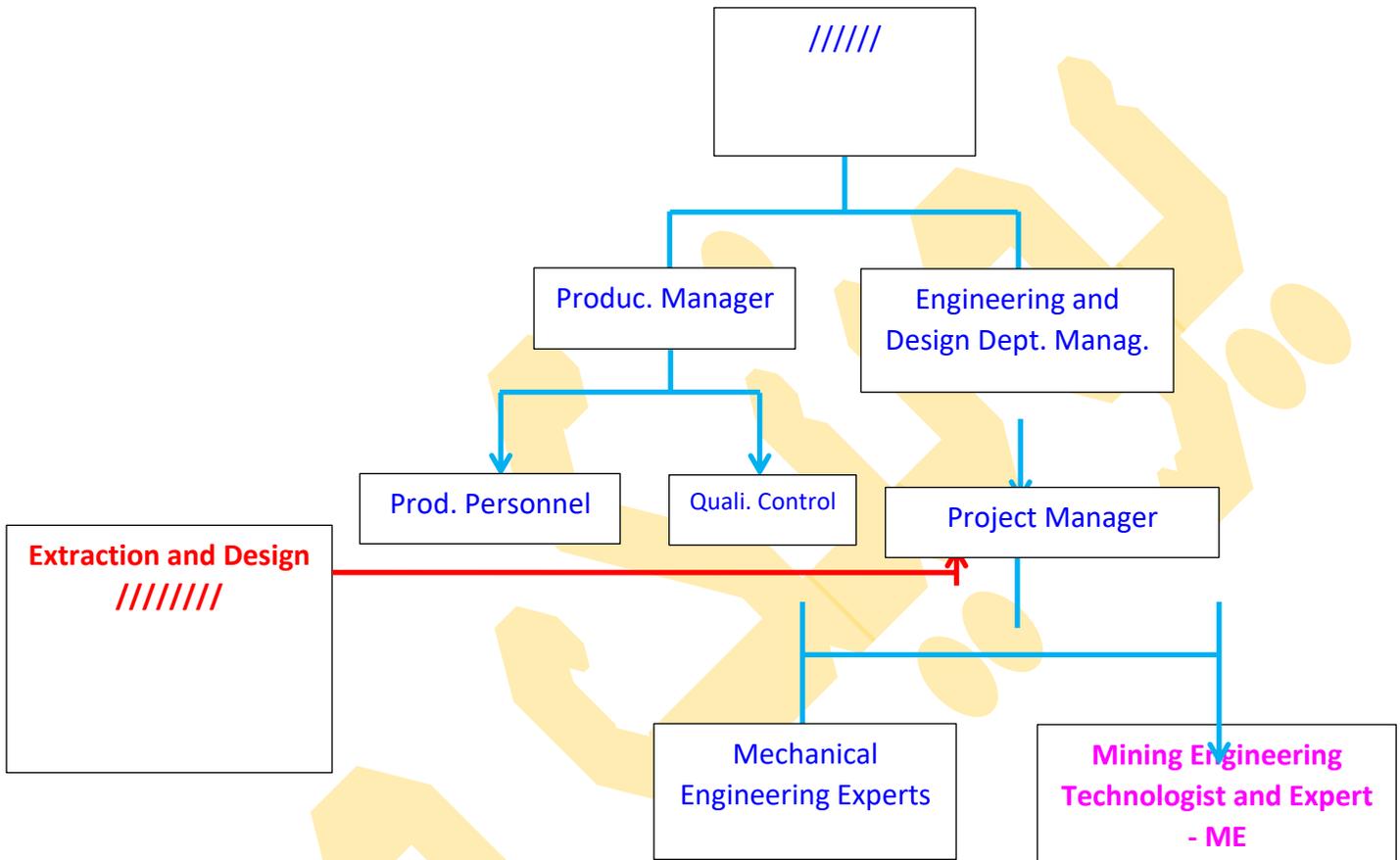
Background

2. 2. The project had different phases including basic phase for collection of information regarding explosive gases ////////////////; next was designing required system for ventilation of mineral tunnels from gases and floating particles. Third phase was designing explosion proof fan for work in underground mine; finally making and testing of explosion proof fan performance.

2. 3. I was assigned through the directing manager of company as engineering technologist in the project; next I started collection and analysis of information regarding gases, airs and explosive particles and explosion in .////////////////. On the other side, my responsibilities in the project were selecting capacity, appropriate design of tunnels ventilation system and selecting proper fan as well as making the fan. During the project, I worked with engineering and design department as well as //////////////// manufacturing department and extraction engineering, repair and maintenance //////////////// environmental department.

2. 4. My major responsibilities as mining engineering technologist was collection and analysis of information about gases and floating particles which were combustible and explosive in mine. I calculated airing and proper discharge of gases from mine underground tunnels; I selected and monitored on design, manufacture and test of explosion proof fan performance. The project main objective as it was defined was because of insufficient ventilation in underground //////////////// which exposed labour to harmful and hazardous gases such as carbon dioxide, carbon monoxide, nitrogen oxides, aldehydes, hydrogen sulphur and other gases and pollutants.

2. 5. Following is organizational chart of the project highlighting my position as mining engineering technologist in the project:



Personal Engineering Activity

2.6. I collected good deal of information about the gases and existing particles in the tunnels air through extraction operations done in underground ///////////////. I researched on the most update papers and research works from different universities and similar companies' experiences in this regard and the way they handled such occasions.

2.7. I designed proper system and capacity for discharge of air from underground mine tunnels from explosive gases and particles considering the complexity of tunnels pattern. After making a visit to

the tunnels and designing the patterns as well as study and researches on the resources and similar projects, I opted for the best method of ventilation. I selected the best type of fan and side electric equipment as explosion proof considering vulnerability and high risk of methane gas ventilation operations.

2. 8. For the above activity purpose, mechanically, and aerodynamically, I studied all types of fans; I selected the best option for explosion proof equipment to maximize safety. One of the important steps in this project was calculating required air quantity for ventilation of considered tunnels.
2. 9. I used the following resources: Fans & Ventilation – WTW(Bill) Cory – Elsevier – 2005, Mine Ventilation Engineering – //////////////// – Society of Mining engineers 1981, Mine Ventilation//////////– 2002 and different articles from the Internet. I used VENTSIM software for modelling motion algorithm modelling and for air current. For analysis and study of air motion speeds in the tunnel, I also used same software. I used MS Office 2010 for preparing reports and tables.
2. 10. During the project, I had internal daily and weekly meetings with the project manager leadership to coordinate the activities and prepare progress reports of the project and think about probable problems during the process of project. On a regular basis, I followed the meetings with //////////////// extraction engineering and design department; I applied their experiences, viewpoints, and their needs in mine ventilation. I applied safety, technical and environmental standards as well as MOH standards in addition to international standards such as ISO5801, ISO5802, AMCA-99-401 and AMCA 210. I never worked alone. I had a teamwork. I worked with mechanical, electrical and installation engineers.
2. 11. Throughout the project timeline, regarding the issues related to cost and time of project, I worked with project manager and research team members. We had joint meetings with project experts and in this regard, I used project control software such as MS Project and Primavera. This project in fact was a safety focused plan through design of proper ventilation system and explosion proof fan and electric system for dilution of explosive gases //////////////// such as methane and explosive and combustible dusts which could endanger the life of labour and safety of mining equipment.
2. 12. I considered that majority of resources were in English, therefore, I tried to study variety of papers on the internet and look for references and books in this regard so that I could come to the best solutions to do my job description and handle my responsibilities inside the project. All the time during the project, I applied my engineering competencies and knowledge especially my communication skills in working with other experts and as a team. I applied other ideas and approaches toward better solution of problems and teamwork. I

learnt and was open to learning from others. I improved my understanding and knowledge about engineering technology.

- 2.13. In this project, it was project manager that assigned different responsibilities; it was emailed to the members through joint meetings and reports. I was in close contact with mechanical engineering experts to coordinate designed mineral methods with installation designs. I studied different papers and resources in English and Farsi. I applied their researches in relation to different design methods.
- 2.14. One of my challenges in this project was selecting the type of fan and electric equipment considering methane gas ventilation operations high risk and vulnerability. For troubleshooting this problem, I considered two things, first I wanted to use axial and or centrifuge explosion proof fan and second, I wanted to match to the international standards. In this project after abundant researches and studies as well as fluid mechanical computations and design of ventilation networks considering intensive air current was required to discharge the underground tunnels of mine from methane explosive gas, I applied axial explosion proof fan.
- 2.15. The other important issue in this part of project was selecting class of explosion proof for axial fan according to the international standards. I applied AMCA99-0401 standard. One of the engineering activities that I did and am product about was that since the air passing through the fan was mixed with methane gas, it was very important that there is no spark since it could easily result in explosion and irreparable damages in the entire mine system. Therefore, I applied electronic industries international standards in electromotor and explosion proof electric terminals in this project. I knew that fan efficiency is also a key feature. I tried to consider economic factors in my calculations. I used the following formula as well: $d_{\min} = (96000/\text{rpm}) \times v_{sp}$
- 2.16. find the best performance point of fan, I drew fan performance curve which shows the relationship between air intensity current and pressure in the speed using MS Excel 2010. For problems and troubleshooting purposes, I used library research method in studying different resources and papers throughout the world. I also used filed research method.
- 2.17. I was in direct contact with different technical departments including design, mechanical and other sections of the company. I applied their experiences in similar projects. I was creative experts in this regard that I did wide researches regarding selection of //////////////// explosion proof fan. I selected most efficient type of fan along with its explosion proof class as most vulnerable part of project.

2. 18. I applied the following standards: ISO 5801 - Industrial Fans-Performance Testing Using Standardized Airways, ISO 5802 – Industrial Fans – Performance Testing in Situ, AMCA 99-401 – Classification for Spark Resistant Construction, AMCA 210 – Laboratory Methods of Testing Faans, ISO 14694 – Specification for balance quality and vibration levels and ISO 10816-3 – Mechanical Vibration.

Summary

2. 19. This project was successful considering achievement of the objectives as defined; dilution of methane gas to the healthy quantity after execution of ventilation network and installation of explosion proof fan was a point. My company got new project offers and client was happy. I learnt many new things in this project.
2. 20. I tried my best that throughout project, I am not disappointed confronting inevitable and hard problems and issues. I relied on my own engineering knowledge. I searched as much as I could in the international references and books. I also consulted and applied viewpoints of experts and specialists. I could satisfy the project management and client with following economic approaches and proper time of management of activates.