

# [Cdr sample mechanical engineer assignment](https://assignbuster.com/cdr-sample-mechanical-engineer-assignment/)

CAREER EPISODE 1 “ Designing of the Side Arm Charger” During the time I have worked at XXXXX since February 2001 for approximately 5 continuous years as a full time mechanical engineering expert I have been assigned several engineering design projects. One of the projects I have been assigned at October 2005 to work on was to design the side arm charger of a wagon un-loader system. XXXXX was selected as the designer and execution supervisor of this project. The wagon un-loader system will be installed in KHORASAN Steel Complex (; KSC) at Neyshabour.

The main purpose in KHORASAN Steel Complex is to construct a reduction plant in order to increase the amount of produced sponge iron to be used in the steel industries. This plant is going to be constructed within a period of 3 years. In order to supply the required oxide pellet, a railway is designed for the plant. Obviously, the major function of wagon un-loader system is to supply the required oxide pellet to the direct reduction plant. I would like to describe my job in this project in 4 different stages as follows: 1) Total Project Planning ) Preliminary Studies 3) Detail Design and Engineering Documentation 4) Project Execution Planning 1) Total Project Planning 1-1) The design project was to be started at October 2005, so the project leader at XXXXX held an introduction meeting approximately at the beginning of September 2005 and the project organization was introduced to include: A project manager, An engineering coordinator and other discipline coordinators were electrical engineering, mechanical engineering, process engineering and fluid coordinators.

The project leader also determined a time limitation of only 3 months for all design and engineering activities before implementation supplier selection. The credit for this part of the project was considered to be around 1. 5 million euros regarding an offer received from a foreign engineering consulting firm out of a 150 million euros as the total credit for KSC reduction plant. 1-2) I was supposed to work under the supervision of the mechanical engineering coordinator accompanying with two other mechanical engineer and two CAD drafters as the mechanical engineering design team.

In this project the mechanical coordinator assigned me the following tasks to assist him in the project: 1-2-1) Design the side arm charger 1-2-2) Communicate with other coordinators 1-2-3) Prepare the design project plan and predict the executive requirements and interfaces with other disciplines. 1-2-4) Prepare the cost/benefit analysis of the design 1-2-5) Attend the meetings as mechanical design team representative 1-2-6) Preparing and finalizing the project progress reports of mechanical design through teamwork. -3) Approximately about 3 working days later I held a meeting with the mechanical design team members and also invited the representatives of other discipline coordinators’ teams. In this meeting we discussed the mechanical design plan, and our overall estimation on design requirements of each individual parts and equipments. I asked about any available information resources and one of our team members suggested to have a visit of such similar systems active under operation in MOBARAKEH Steel Complex & BANDAR ABBAS Harbor.

After assignment of design activities, I asked all team members on how to make effective and fast communications when required. Finally we decided to communicate with emails through our INTERANET and provide a flat network connection to inform each other and take the responsibility of each other activities with close relations and communications through a fully authorized friendly working environment. We also defined and agreed on our weekly technical meetings time. 1-4) I suggested providing such a mentioned friendly flat environment for work to my direct boss and he accepted and approved the suggestion.

At the same meeting I suggested to communicate the project progress and relevant technical issues each week on Mondays and every body accepted. 1-5) Finally I ordered to prepare a design project draft plan and we discussed it through our technical team and asked for any required modifications from other disciplines representatives then I finalized the mechanical design project plan at the same time when the other teams were working on their own plans. I submitted and discussed the design project plan to the mechanical coordinator and took his approval on the plan.

I had planned to complete all the activities including design, verification, and inquiry document preparation and engineering drawing and quality control plan documentation within 3 months. 1-6) After I took the approval of the mechanical design project plan, I conducted to provide an overall cost estimation of the design and execution of such a project considering a parametric cost estimating method based on a conceptual and preliminary draft design and reported the documented results to the mechanical coordinator.

Regarding the results achieved we predicted an approximate saving of 250, 000 euros only due to mechanical engineering design and execution. 2) Preliminary Studies 2-1) To get aware about the client’s technical requirements, since the wagon un-loader system was designing for the first time in Iran, first of all it was required to know about the function and duty of the wagon un-loader system. I requested a technical meeting with the process engineering team under the supervision of process engineering coordinator to get introduced to such an un-loader system.

The process engineers described us the major function of the wagon un-loader to supply the required oxide pellet to the direct reduction plant. Wagon un-loader system mainly consists of three major machines that are wagon dumper, side arm charger and indexer, among which the mechanical design of the side arm charger was assigned to me. 2-2) Furthermore I requested to have a visit of MSC and BANDAR ABBAS wagon un-loaders that were in active operation to achieve a better understanding of the system function accompanying my other team members.

The visit travels were programmed and the team studied all required information during the visits. We also had arranged some meetings with the relevant technical staffs in each operation sites. 2-3) In this step, when I recognized the technical requirements through different resources including the available and similar site visits and taking photos, attending technical meetings with the process engineers, studying the available confidential engineering documentations and drawings, I documented all these information in an engineering specific format to provide a well query based database to be able to access any required data fast. -4) The side arm charger which is an essential equipment of the un-loader system among all three machines, is a machine that pulls the whole amount of wagons with the amount of the length of one wagon, supplies the first wagon to the indexer and then turned back to its initial position. At this time the indexer moves forward through the wagon dumper system and leaves the wagon in the wagon dumper and turned back to its first position. At the same time the wagon dumper rotates with a specific angle and recharges the wagons. The total amount of process is estimated to be take only about 2 minutes. -5) By studying the two active side arm chargers in MSC & Bandar Abbas harbor I deducted the individual parts of the equipment consisted of a structural frame, a side arm, the moving wheels, the guide wheels, the coupling, drive unit, electrical equipment, lubrication unit, hydraulic unit and a laser distance meter in order to distinguish the correct and exact distance of required movement. 3) Detail Design and Engineering Documentation 3-1) I prepared a design draft of the structural frame comparing the wagon length of the new system and the two existing systems I have visited. Then, I ordered to prepare its relevant 3D model in SOLIDWORKS.

To determine the internal support forces applied on the side arm I had to study the side arm free body diagram individually so I required to prepare another 3D model individually for it. 3-2) Considering the actual operating conditions as daily working hours, and annual plant capacity and each wagon capacity I calculated constants such as the coefficient of rolling friction (regarding the standard data I extracted from MACHINERY HANDBOOK 25), required speed with respect to the required capacity per hour, required time for acceleration and advancing and total process time of the side arm charger.

Finally I calculated the approximate required power and inertia of the wagon system. Then I determined applied loads and moments on the structural frame and side arm and I calculated the reactions of the supports as per actual situations and determined the boundary conditions. Then I imported the 3D models into ANSYS and applied the load and boundary conditions as per calculated. Then I ran a finite element analysis on the defined materials of steel to determine the critical stresses and deflections to identify if the design is acceptable. -3) When I ran the finite element analysis using ANSYS on the side arm charger and its frame, the critical stressed points on the models were determined. I held a technical meeting with others to find a proper solution through teamwork. The technical team discussed the results and suggested to improve the models using some stiffeners in areas required while using thicker plates and stronger beams with higher moment of inertia in some other parts of the model where in each case the limitations on using different elements were considered. -4) In the next step considering calculated reaction forces on the supports I designed the moving wheel, its shaft and finally I selected proper standard bearing using SKF catalogue considering the required dynamic load capacity. After all using SKF electronic catalogue I calculated the bearing exact capacity, working cycles and the power loss. 3-5) As the final step I had to design a proper drive system regarding the computed power.

Considering the available and studied existing systems I decided to select a hydraulic motor with its relevant planetary gearbox because of a compact economic design and capability to transmit the max power possible in comparison with other systems available like servo-mechanism systems with direct or worm and gear gearboxes. I designed such a proper hydraulic drive system with the relevant gearbox; referring to the REXROTH catalogue available and I selected a rack & pinion power transmission system to transfer the output power after gearbox to the wagons. 3-6) At each of design steps mentioned above I documented: ) The engineering and design documents in details accompanying supporting graphs, charts and FEA results including stress and deflection graphs 2) The detail designed 3D models and relevant 2D workshop and practical drawings 3) The design procedures and required illustrations in detail using Microsoft Word & Microsoft Excel 4) The intermediate project progress reports to be discussed in our technical meetings as the report of the work done by our team and to be reported to the mechanical engineering department for any further arrangements in the top management and project leaders meeting 3-7) Finally at the end of December 2005, I conducted the documentation of all engineering results achieved and 2D workshop drawings and further I performed another cost/profit analysis based on the actual design results obtained and included all these results in the final project report book which as the appendix also had a section on all spare parts required. I also predicted the execution time that may required only for mechanical equipment manufacturing and installation and submitted the results to the mechanical engineering coordinator to be discussed in the major project leaders meeting. 3-8) Since I have matched the interfaces of our design results with other teams, it was easily possible for us to provide the mechanical equipment execution inquiry documents soon.

So I conducted to provide a written draft and held a meeting with other top leaders representatives and some non-technical people from XXXXX contract department to discuss and finalize the execution tender documents. After some open negotiations some suggestions were applied and a complete inquiry document was finalized and agreed. In addition I ordered the procurement of the hydraulic drive system and related accessories to XXXXX international partner called IRASCO through our contract department to be on time on delivery of these parts that had to be imported. 4) Project Execution Planning 4-1) After finalizing the mechanical equipments inquiry documents, I conducted to provide an execution project cost/benefit analysis along with the relevant gunt chart for such a project.

I combined all these documents together and after taking the mechanical coordinator approval in addition to other coordinators agreement, we passed the inquiry documents to XXXXX contract department for tender. 4-2) The contract department held the tender and finally the execution supplier who was responsible not only for mechanical and total process engineering but also for electrical equipments, was selected and introduced to our technical supervision team. 4-3) I accompanying the representatives of other teams finalized the execution project plan with the supplier and revised the required man-hour per each activity in some areas and helped his technical team with the 2D workshop drawings and other engineering documents provided for ease of implementation. -4) I conducted teamwork to prepare the required quality control plans for mechanical equipments and parts during the 5 weeks to the end of the 3rd month of the design and engineering when the design was completed and the workshop executive 2D drawings were under preparation. My practical knowledge and experiences in quality control and inspection either in-site or by taking services from outside inspectors and laboratory services always helps me effectively in preparation such a quality plans. I always bear in mind when in execution any suggestions from supplier’s technical staffs have to be studied and accepted if practical as compared to our experienced experiments. 4-5) The finalized project plan passed to the supplier for execution and it was estimated to take around 12 months to be totally implemented and the equipments would be installed.

Our final calculations together with all the other teams indicated with the design activities done in XXXXX there was a saving of around 500000 euros out of the 1. 5 million euros offer received from the foreign engineering consultation company. Summary At October 2005, I was assigned by XXXXX to work on a project to design a side arm charger in a wagon un-loader system for KHORASAN Steel Complex reduction plant in Neyshabour. I was working under the supervision of mechanical engineering coordinator of this project and two other mechanical engineers and two CAD drafters were working under my supervision and directly reported to me. I had to perform the following activities: 1) Total Project Planning 2) Preliminary Studies 3) Detail Design and Engineering Documentation 4) Project execution Planning

Each of the above-mentioned steps was executed in further sub-steps for further considerations. Also I had to report continuously to mechanical coordinator. To show the progress and respective improvements and engineering design results I prepared project progress reports including engineering details with supporting graphs and charts using Microsoft Power Point. Apart from this I have always tried to achieve recognition from by doing my duties on time and in the best way possible. The engineering design part of the total project was planned for 3 months and we successfully conducted the project and spent no more time even after providing the mechanical parts quality control plan.