This research aims to build a model application of decision-making tools to solve problems associated with the contractor selection for Engineering, procurement and Construction (EPC) projects in the Oil and Gas sector. Taking into consideration the complexity of Oil & Gas projects in terms of technical, safety and environmental aspects, it is critical to choose a competent contractor to build quality plants as per scope specifications and within the specified time and budget. This study also covers problems associated with contractor short listing without proper contractors screening and pre qualifications activities, this might result in low cost bidding from non-competent bidders. Because current local tendering practices favors lowest price regardless of quality, this resulted in enormous problems when executing Oil & Gas projects such as projects failures and delays coupled with the absence of interest in our local market from reputed international EPC contractors. Because contractors screening and bid slate selection is a complex exercise that requires large amount of contractors data gathering and the associated analysis to achieve the required bidders short listing. Therefore, a model for contractors screening and selection was developed in this study where each contractor data base are gathered and analyzed. Such data includes discipline, previous activities, financial exposure, geographical locations, works backlogs and engineering capabilities. The Model called Analytical Hierarchy Process (AHP) was designed to improve contractor selection process based on established criteria. In this regard, 48 criteria and categories (mainly contractor capabilities financial, management, technical, resources etc.) were identified. They were mainly drawn from literature reviews, the author previous experience, lessons learned from past projects and NOC’s & IOC’s experience. The 48 categories, and based on subsequent meetings and discussions with several respected local Oil & Gas projects expertise, were divided based on relative importance to contractor selection process into two parts, Primary (7 categories) and Secondary (remaining categories). AHP is a compensatory decision methodology because alternatives that are deficient with respect to one or more objectives can compensate by their performance with respect to other objectives. AHP allows for the application of data, experience insight, and intuition in a logical and thorough way and enabling decision-makers to structure complexity and exercise judgment and allows them to incorporate both Goal Objectives (criteria), Sub-Objectives Alternatives objective and subjective considerations in the decision process. AHP enables decision-makers to derive ratio scale priorities or weights as opposed to arbitrarily assigning them. In so doing, in this research, (MS Excel) was used in addition to (Expert Choice), one of the prepackaged software that was utilized to study the sensitivity of the results and a case study of selecting a contractor. The AHP model is flexible and user friendly and can be applied at different stages of contractor selection process. In addition it can be utilized as a decision-making for a working group by analyzing the inputs of the working group members and highlighting deviations, biases, results and advising corrections. Utilizing AHP model encourages and promotes contracting good practice of national companies and institutions and enhances the decision-making capabilities and provides for a fair guidance while contracting for major Oil & Gas projects in Libya.