An auto lifting device to lift manhole cover with ergonomics consideration

ABSTRACT

The sewerage and maintenance process of manhole is important to ensure that the underground pipelines and other systems are in good condition. The manhole is covered with manhole cover to prevent people, animals or any objects fall into it. The manhole cover has one pocket which is to lock it and ensure that nobody open it. A questionnaire survey is distributed to the workers at Indah Water Konsortium Sdn Bhd, Kuala Lumpur and interviews are conducted with Indah Water Konsortium (IWK) and Jabatan Perkhidmatan Pembentungan (JPP), Selangor to access the user requirements and needs for an effective manhole cover lifter. Currently, the workers used a T-hook to unlock the heavy manhole cover and lift it. However, this method affected some of the workers because they experienced back, legs, shoulders and arm injuries. The T-hook is also quite heavy and it is difficult to bring anywhere. Based on the result of questionnaire survey, four concepts are designed to create new manhole cover lifter with automated operation. The best concept is finalized by using concept screening and scoring method. The chosen concept is applied pulley chain mechanism and it is selected as the best concept because it is easy and safe to use, low cost maintenance, low time consuming and affordable price. The design of the device is suitable for Malaysian male and secured them from musculoskeletal disorder. The worker's posture is analyzed by using Rapid Upper Limb Analysis (RULA) ergonomics analysis. The stability and strength of the device is analyzed by calculation and Finite Element Analysis (FEA) is used to analyze the screw cylinder.