



# 건설기계 안전 고도화 방안 연구



## 영상처리 기반 사람-사물 인식 알고리즘을 활용한 건설기계 협착 사고 예방 연구

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### Preventing Crush Accidents in Construction Machinery Using Image Processing-Based Human-Object Recognition

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**Key Words :** Image Processing(영상 처리), Worker Detection(작업자 인식), Crush accident prevention(협착 사고 예방), Safety system(안전 시스템), Automatic stop(자동 정지)

#### ABSTRACT

Crush accidents between heavy construction machinery—such as excavators, rollers, and motor graders—and workers frequently occur at construction sites. These accidents are mainly caused by operators’ blind spots and the absence or limited performance of detection devices. Conventional accident prevention technologies rely on safety bars or simple video cameras, which have limitations in enabling operators to accurately detect workers located in blind areas. To address this issue, this study developed an image processing-based human-object recognition algorithm to detect crush hazards at an early stage and examined the feasibility of controlling machine operations in response. The algorithm processes video data from cameras in real time to identify workers, and when a worker is detected, it is linked to a safety control logic that automatically stops the machine or issues a warning signal. In future work, experiments will be conducted in a test environment that simulates real construction sites, considering various field conditions such as the number of workers and background complexity. The system’s detection performance will be evaluated, and the integration of additional sensors such as LiDAR will be explored to improve distance and relative position estimation and real-time coordination with machine control systems. This study presents the potential of image processing-based crush accident prevention technology for application to high-risk construction machinery, and it is expected to become a key element of future safety management technologies for construction equipment.

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## 디젤엔진 건설기계의 DPF 매연 적설량 측정 방법

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### A Method for Measuring Soot Accumulation in DPF for Diesel-Powered Construction Machinery

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**Key Words** : Construction machinery(건설기계), DPF(디젤 미립자 필터), Soot accumulation(매연 적설량)

#### ABSTRACT

The Air Quality Conservation Act mandates that operating vehicles and construction machinery be equipped with emission reduction devices to improve air quality and reduce the emission of substances that cause climate and ecosystem changes. For construction machinery that primarily uses diesel fuel, Diesel Particulate Filters (DPFs) and Selective Catalytic Reduction (SCR) are used as emission reduction devices.

A DPF operates by trapping particulate matter (soot) and then incinerating it to reduce emissions. If the trapped soot is not burned off, it can lead to reduced emission reduction performance and a decrease in engine power. Therefore, it is necessary to check the accumulated amount of trapped soot and burn it when it reaches a certain level. However, there is currently no quantitative method to do this in the field, so inspectors must rely on the qualitative criterion of exhaust gas color.

This study aims to find a quantitative method to measure the amount of soot accumulated in a DPF. The research focuses on construction machinery with diesel engines and investigates an electronic method, specifically through communication, to measure the amount of trapped soot in the DPF. The goal is to improve the inspection and management procedures for construction machinery in real-world field environments, making them more intuitive and straightforward than the current methods.

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## 타워크레인 외관 검사에 대한 UAV 활용 가능성 분석

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### Evaluation of UAV Utilization in Safety Inspection of Tower Cranes

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**Key Words** : Unmanned Aerial Vehicle (UAV), Tower Crane, Construction Machinery, Structural Inspection, Safety Management, Maintenance

#### ABSTRACT

Unmanned aerial vehicles (UAVs) are increasingly used in industrial sites to inspect areas that are difficult or hazardous for human access. With the advancement of UAV technologies and the expansion of related markets, their applications have extended to diverse fields, driven by advantages such as reduced labor costs, improved inspection accuracy, and enhanced safety. This study focuses on the applicability of UAV-based inspection techniques to tower cranes, which are classified as high-risk construction machinery.

To achieve this, previous studies and both domestic and international inspection manuals were reviewed. Through this analysis, potential inspection items and methods that can be performed by UAVs were identified. The study particularly highlights external inspection tasks that can be effectively conducted without direct human intervention, such as assessing structural components, detecting visible defects, and monitoring operational conditions.

The results suggest that UAV-based inspection technologies hold significant potential for integration into safety management practices for tower cranes. By adopting such technologies, it is possible to reduce inspectors' exposure to dangerous environments while ensuring consistent and reliable inspection outcomes. Ultimately, the findings of this research are expected to contribute to establishing safer and more efficient maintenance systems for tower cranes and, more broadly, for other large-scale construction equipment.

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## 건설기계 안전기준 시행세칙 고도화 연구 소개

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### Introduction to Research on Advancing the Enforcement Regulations of Construction Equipment Safety Standards

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**Key Words :** Construction machinery(건설기계), Safety regulations(안전기준), Enforcement rules(시행세칙), Advanced research(고도화 연구)

#### ABSTRACT

The Rules on Construction Equipment Safety Standards were promulgated on February 12, 2008, as Ordinance No. 606 of the Ministry of Construction and Transportation. Since their initial enactment, these regulations have undergone multiple revisions, primarily aimed at enhancing on-site safety and related systems. However, in certain instances, detailed testing methodologies for verifying compliance with safety standards have been lacking, and the most recent advancements in construction equipment technologies have not been adequately incorporated. To address these shortcomings and comprehensively strengthen construction equipment safety, the Korea Transportation Safety Authority commissioned a research initiative in 2025 to advance the Enforcement Rules for Construction Equipment Safety Standards. The Enforcement Rules for Construction Equipment Safety Standards delineate specific testing protocols designed to verify performance criteria, thereby ensuring conformity with established safety standards. Moreover, compliance with equivalent Korean Industrial Standards (KS) or International Standards (ISO) for the corresponding test items is also deemed to fulfill the requirements stipulated in the Enforcement Rules. This study aims to identify and analyze components of the current safety standards and enforcement regulations that necessitate revision in order to improve construction equipment safety.

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## 건설기계 안전관리 관점의 건설기계관리법 통합해설서 개발

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### An Integrated Commentary on the Construction Machinery Management Act: A Safety-Management Perspective

Soo-Yeun Park\*

**Key Words** : Construction Machinery Management Act(건설기계관리법), Integrated Commentary(통합해설서), Safety Management(안전관리), Legislative History(개정연혁), Authoritative Interpretation(유권해석)

#### ABSTRACT

This study aims to develop an integrated commentary on the Construction Machinery Management Act (CMMA) from a safety-management perspective by systematically analyzing the Act and its subordinate regulations and preparing clause-by-clause interpretations. The commentary organizes practical issues and proposes policy ideas for institutional improvement. We first outline the system's formation and changes through the amendment history and identify the law's purpose and intent. We then compare the CMMA with the Motor Vehicle Management Act and the Occupational Safety and Health Act to extract similarities and differences in governing actors, requirements, procedures, and structure. We also map the delegation structure across the Act, Enforcement Decree, and Enforcement Rule at the clause level and align it with safety-management institutions. Finally, we analyze authoritative interpretations for each clause and design a practitioner-oriented annex. The results provide basic guidance for policy reports and legislative amendments and offer a legal and institutional basis to enhance lifecycle safety management across all machine categories, including high-risk equipment.

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