

Systemic Analysis and Violation of the Professional Code of Ethics of Engineers: A Case Study of the PT ITSS Smelter Furnace Explosion Tragedy in Morowali

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Abstract.

Indonesia's nickel processing industry plays a strategic role in the global economy, yet fatal occupational safety incidents continue to plague the sector. This study aims to examine in-depth allegations of ethical violations in the PT Indonesia Tsingshan Stainless Steel (ITSS) smelter furnace explosion tragedy in Morowali on December 24, 2023. This study uses a descriptive qualitative method with a case study approach, analyzing secondary data through the lens of the Indonesian Engineers Association (PII) Code of Ethics and the Swiss Cheese Model accident investigation theory. The analysis reveals serious violations of the Catur Karsa principles, particularly the obligation to prioritize public safety. These failures are systemic, involving negligence in risk management, oversight of repair procedures (hot work), and the dominance of production interests over safety. This study recommends reforming the occupational safety and health culture by strengthening the authority of professional engineers and enforcing strict ethical sanctions.

Keywords: Professional Ethics of Engineers, Occupational Safety (K3), Nickel Smelter, PT ITSS and Swiss Cheese Model.

I. INTRODUCTION

Over the past decade, Indonesia has positioned itself as a key player in the global supply chain for electric vehicle batteries and stainless steel through its nickel downstreaming policy. Industrial parks like the Indonesia Morowali Industrial Park (IMIP) have become the center of gravity for this investment. Engineering plays a crucial role in this ecosystem, tasked with designing, building, and managing the high-tech infrastructure that supports these operations.

However, these technological advances and massive investments bring significant ethical challenges. The power of engineering must be balanced with a non-negotiable moral responsibility. An engineer is not only accountable to the client or company (corporate liability), but also has a broader social responsibility for the safety, health, and welfare of the community, including its workers.

The tragic smelter furnace explosion at PT Indonesia Tsingshan Stainless Steel (ITSS) in Morowali on December 24, 2023, marked a dark turning point for the national engineering industry. The incident, which occurred at approximately 5:30 a.m. WITA (Central Indonesian Time), claimed the lives of dozens of workers and caused serious burns to many others. This case was not just an ordinary workplace accident, but rather an indicator of a systemic failure in the implementation of professional ethics and Occupational Safety and Health (K3) procedures.

II. THEORETICAL STUDY

Indonesian Engineers Code of Ethics and Global Standards

The ethics of the engineering profession in Indonesia are regulated by the Indonesian Engineers Association (PII) through the Catur Karsa and Sapta Dharma. The principle most relevant to occupational safety cases is the first point of the Catur Karsa: "Prioritizing the safety, health, and welfare of the public." This principle aligns with international codes of ethics, such as that adopted by the National Society of Professional Engineers (NSPE) in the United States, which states that "Engineers shall hold paramount the safety, health, and welfare of the public."

The Sapta Dharma reinforces this with the second and third points, which demand the use of knowledge for the welfare of humanity and earnest work in accordance with responsibilities. This implies that failure to ensure technological security is not merely a technical error, but a violation of the professional oath.

Ethical Theory in the Context of Occupational Health and Safety

Three ethical theoretical frameworks are used to dissect this case:

1. **Deontology (Ethics of Obligation):** Assess actions based on compliance with regulations. In an engineering context, engineers have an absolute duty to comply with OSH Standard Operating Procedures (SOPs). If SOPs are violated, the action is unethical, regardless of efficiency motives.
2. **Teleology (Utilitarianism):** Evaluate actions based on consequences. If a decision is made to pursue a production target (economic benefit) but at the expense of lives (massive loss), then from a utilitarian perspective, the action is unjustifiable because it results in far greater harm to humans.
3. **Virtue Ethics:** Focus on the agent's moral character. A professional engineer should possess virtues such as prudence and integrity. Allowing repairs to a furnace that still contains hazardous materials demonstrates a lack of these virtues.

Workplace Accident Theory: Swiss Cheese Model

To understand the technical aspects of failure, James Reason's Swiss Cheese Model theory is used. This theory states that major accidents are rarely caused by a single error. Instead, accidents occur when multiple layers of defense (systems, procedures, controls, and operator actions) fail simultaneously, causing "holes" in each layer (like Swiss cheese) to align and allow hazards to escape into a fatal accident.

III. RESEARCH METHODS

Research Design

This research uses a descriptive qualitative design with a single case study approach. This approach was chosen because it allows for in-depth analysis of contemporary phenomena within real-life contexts, where the boundaries between phenomenon and context are not clearly defined.

Data source

The data used is secondary data collected from credible and verified sources, which include:

1. **Mass Media Reports:** Investigative coverage from national media (Kompas, Detikcom, BBC Indonesia) to build a chronology of events.
2. **Official Documents:** Press release from IMIP Area management and official statement from the Indonesian Ministry of Manpower (Kemnaker) regarding the results of the initial investigation.
3. **Academic Literature:** Journals and books related to engineering ethics and industrial process safety.

3.3 Data Analysis Techniques

The data was analyzed through three stages: (1) Data reduction to sort out relevant chronological facts; (2) Presentation of data in the form of descriptive narratives; and (3) Drawing conclusions by matching field facts to the articles of the PII Code of Ethics and occupational safety theory.

4. CASE DESCRIPTION AND CHRONOLOGY

4.1 Incident Overview

An explosion occurred in ferronickel furnace No. 41 of the PT ITSS smelter facility on Sunday morning, December 24, 2023. The facility uses Rotary Kiln-Electric Furnace (RKEF) technology, which operates at extreme temperatures to separate nickel from raw materials. The inherent risks of this process are very high, involving hot molten metal and pressurized gases.

Chronology of the Event

Based on the investigation, the incident began while the maintenance team was repairing and installing plates on the furnace wall. During the work, it is strongly suspected that there was still residual slag (slag/smelting waste) at the base of the furnace. Standard hot work procedures require the work area to be kept clear of explosive or reactive materials.

However, the remaining hot slag then came into contact with other materials (possibly coolant or leaks from the furnace walls) or was triggered by welding activities, causing a sudden thermal reaction. The initial explosion triggered a domino effect, exploding oxygen cylinders located around the work site for welding/cutting purposes. This drastically increased the scale of the fire and blocked evacuation routes for workers on the furnace platform.

Humanitarian and Institutional Impacts

This incident resulted in the deaths and injuries of dozens of workers, including both Indonesian Migrant Workers (TKI) and Foreign Migrant Workers (TKA). The social impact extends to the psychological trauma of the workers' families and communities in Morowali. Institutionally, the reputation of PT ITSS and the IMIP area has been severely damaged, facing intense scrutiny regarding safety standards and potential criminal and administrative sanctions from the government.

IV. ANALYSIS AND DISCUSSION

Identification of Code of Ethics Violations: Failure of Catur Karsa

Analysis of the facts demonstrates a clear violation of the First Point of the Four Principles. This principle requires engineers to prioritize public safety above all else. The decision by engineering management or field supervisors to permit furnace wall repairs while slag remains is evidence of a disregard for this principle.

In engineering ethics, there is the concept of the Paramountcy Clause, where the obligation to protect life outweighs the obligation to superiors (company loyalty). If an engineer knows the furnace is unsafe (not fully purged or the temperature has not yet dropped to safe limits), but still signs a work permit due to production schedule pressures, he or she has committed serious ethical malpractice.

Analysis of Violation Forms through the Lens of the "Swiss Cheese Model"

Using James Reason's theory, we can map this failure as follows:

1. **Organizational Influence:** A corporate culture that may prioritize ferronickel output targets over downtime for repairs. This pressure creates an atmosphere where safety procedures are perceived as a hindrance.
2. **Unsafe Supervision:** The supervising engineer or supervisor failed to conduct an adequate field walkthrough before issuing a work permit. Failure to ensure energy isolation (lockout-tagout) and removal of hazardous materials constitutes supervisory incompetence.
3. **Pre-conditions for Unsafe Act:** The presence of a large number of oxygen cylinders in an area with the potential for explosion indicates poor housekeeping management and an in-depth risk analysis (Job Safety Analysis).
4. **Unsafe Acts:** Carrying out repair work (hot work) on a furnace that is active or not yet fully stable.

Professional Responsibility Evaluation

Engineers holding the role of Chief Engineer or Engineering Manager bear Professional Liability. They have a legal obligation to ensure that the designed SOPs comply with scientific standards and are executed correctly.

Furthermore, there is moral responsibility (accountability). Even if an engineer was not present at the time of the incident, if he or she participated in designing a "lax" work system or allowing an undisciplined work culture, he or she shares moral responsibility for the loss of life. The inability to say "NO" to unsafe work demonstrates the engineer's weak professional character.

Ethical Dilemma: Misguided Utilitarianism

This case often reflects a misapplication of Utilitarianism. Management may believe that expediting repairs will bring "good" in the form of quick economic gains. However, this calculation is flawed because it fails to include the variable of "human life," which is an infinite value. In modern ethics, saving life is a non-tradable value. Sacrificing safety procedures for the sake of time efficiency is fundamentally unethical.

V. RECOMMENDATIONS AND ALTERNATIVE SOLUTIONS

Systemic and Procedural Improvements (Technical Level)

1. **Implementation of a Multi-Layered Permit to Work System:** All work in critical areas such as furnaces must undergo a multi-level approval process involving the Process Engineer, the OHS Engineer, and the Plant Manager. Permits cannot be issued without physical evidence (photographs/videos) that the area is clear.
2. **Rigorous Job Safety Analysis (JSA):** A JSA should not be simply an administrative document. A

site briefing (toolbox meeting) should be conducted that addresses specific potential hazards (such as slag residue) before any work equipment is touched.

6.2 Strengthening Culture and Ethics (Management Level)

1. **Stop Work Authority:** Provide immunity from sanctions and full authority to every level of workers, especially K3 engineers, to stop operations immediately if they detect anomalies, without fear of intimidation by superiors.
2. **Sustainable Ethics Education:** Require professional ethics training that addresses real-life case studies (such as this tragedy) as a condition for promotion to technical positions.

6.3 The Role of Professional Associations (Policy Level)

The Indonesian Engineers Association (PII) must be more proactive in conducting ethics audits of engineers working in high-risk sectors. Professional Engineer (IP) certification should be revoked for those found to be professionally negligent, as a form of public accountability.

VI. CONCLUSION

The tragedy of the PT ITSS smelter furnace explosion in Morowali was not just fate or an unavoidable accident, but a man-made disaster rooted in the degradation of professional ethics.

The analysis concluded that there had been a serious violation of the Indonesian Code of Ethics for Engineers, particularly in terms of protecting public safety. The engineers and management involved failed to apply the principles of due care and competence in managing the extreme risks of the metallurgical industry.

This case provides a bitter lesson: in the world of engineering, technical competence alone is not enough. Moral integrity and the courage to uphold ethical standards—even under corporate pressure—are the only safeguards that can prevent technology from turning into a killing machine. Without fundamental improvements to ethical culture and oversight systems, the ambition to downstream the industry will continue to cost workers their lives.

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