

CASE STUDY

Enhancing Safety in the
Recoiler Area of Steel Plants with
The Trapped Key Interlock Solution

Related Industries

Steel Plant | Aluminium Plant
Copper Plant | Packaging Industries



#M/P Safety

Integrated Machine
Safety Process
Interlocking &
LOTO-TO



Enabling Safe, Productive
& Profitable Workplace

TERMINOLOGY DEFINITION

■ **Recoiler:**

A machine that winds up steel coils after processing.

■ **Trap Key:**

A safety mechanism using keys in a predetermined sequence that prevents unauthorized access to a machine while maintenance is being performed thus preventing shortcuts and enhancing operator safety.

■ **Engineering Control:**

Physical modifications to the workplace that reduce hazards (e.g., safety devices, interlocks, machine guards).

■ **Administrative Control:**

Policies or procedures aimed at reducing risks (e.g., training sessions, safety protocols, LOTO procedures).

■ **OSHA:**

Occupational Safety and Health Administration is a U.S. agency that ensures safe and healthy working conditions by setting and enforcing standards.

■ **RPM:**

Revolution Per Minute

■ **Man-Machine Interface:**

The interface that ensures effective communication, control, and feedback between humans and machines to prevent accidents, reduce errors, and enhance operational safety.

BRIEF OVERVIEW

Safety in steel plants is paramount, especially where heavy machinery and human interaction pose significant risks. In a recoiler area incident, a tragic accident occurred due to unsafe practices like manual coil tension adjustments on a high-RPM machine, exposing a critical gap in safety protocols.

Similarly, an unexpected startup incident resulted in a fatality, underscoring the dangers of process deviations and blind spots.

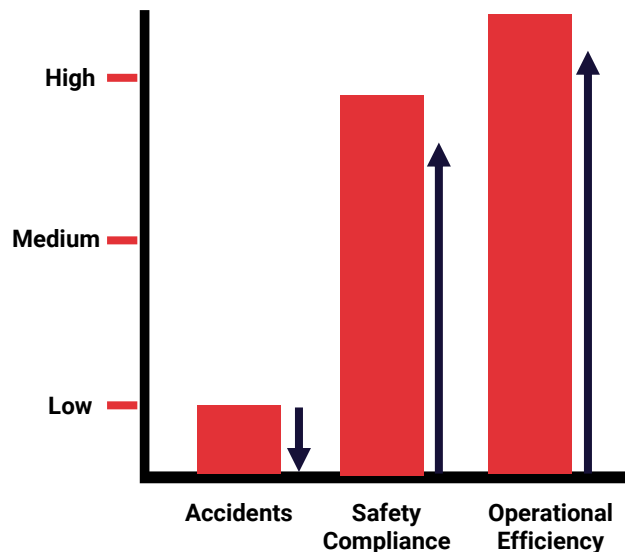
BRIGS in collaboration with **Fortress** implemented a Trapped Key Interlock System that enforces stringent safety protocols, ensuring no machine operation is possible without fully adhering to predefined safety measures. This solution not only prevents accidents but also minimizes downtime by providing safe access for minor maintenance activities.

The Result

- Accidents Down
- Safety Compliance Up
- Operational Efficiency Boosted

The Impact

- Immediate and
- Enduring



This case study showcases the transformative power of engineering controls in creating safer, more productive industrial environments.

It's not just jargon but real change in action.

THE CONCERN

Steel plant operations present a range of hazards.

Hazards in Steel Plant



Giant Machinery and
Movement of
Massive Equipment



Man – Machine
Interface Issues



Extreme Conditions -
Exposure to Heat
and Fire



Toxic



Corrosive Materials



Fire



Noise and Vibrations



Explosives



Fall Hazard



Biological Hazard



Electrical Hazards



Isolation Hazards

Amongst all the hazards one major area of concern in a steel plant is the **Man-Machine Interface**. Despite LOTO procedures, safety violations often occur due to pressure or shortcuts, which led to fatal incidents at a steel plant recoiler area.

THE CONCERN

Safety Gaps

- **Unsafe Practices and Shortcuts:**

An operator using a rod to adjust coil tension on a high-RPM machine, suffered a fatality when their loose clothing got trapped. This highlighted the risk of manual interventions without applying jog mode on hazardous machines.

- **Unexpected Machine Startup:**

After lunch, an operator adjusted coil tension inside the slitter line without informing the colleague, leading to a blind spot fatality when the machine was started.

These events not only resulted in the loss of life but caused a two-month production halt, adding to operational losses. The incidents emphasize the need for robust, engineering-driven solutions to mitigate risks.

Mitigating Risk

To mitigate the immense mix of hazardous variables at a steel plant it is necessary to have a combination of



Engineering and
Maintenance
Practices



Safe Working
Procedures



Training and
Communication



Personal Protective
Equipment (PPE)

THE CHALLENGE

The client required a solution that would not disrupt operations, particularly during coil alignment and adjustment, without necessitating full machine isolation. However, the challenge lay in ensuring that such operations could be performed safely, without any risk of unexpected startups or unauthorized access.

THE SOLUTION

Although LOTO saves lives, it remains on OSHA's top 10 list for the most cited violations. The main reason is that LOTO is an Administrative Control that can be bypassed.

In most cases of work accidents, fatigue, complacency, and work pressure are the biggest causes of deviation from protocols. Therefore, **engineering control** has proven to be the most reliable in addressing such scenarios.

That is why **BRIGS** proposed **The Trapped Key Interlock Solution of Fortress**. This engineering control ensures that the machine cannot start unless all safety conditions are met. In addition, the solution offered custom flexibility, addressing major and minor maintenance activities, where traditional LOTO methods either weren't feasible or often bypassed.

Safety Features:

- **Certified and Robust:**

A certified CAT 4, PL e device capable of withstanding 10KN of force, offering maximum protection.

- **Vertically Engraved Non-Duplicable Key:**

Ensures tamper-proof control with a unique combination, with the probability of duplication as low as one in 2 million.

- **Rugged Key:**

Designed for harsh industrial environments, the key is tested to perform reliably over 1 million cycles before deployment.

- **Safety-Rated Key Switch:**

Features NC-NO connections, eliminating the risk of arcing or welding, which prevents false feedback – a significant advantage over standard switches.

- **Patented Door Lock Module:**

Incorporates a forced key extraction system with a mechanical actuator, ensuring the key is always removed after use and not left in the door, enhancing operational safety.



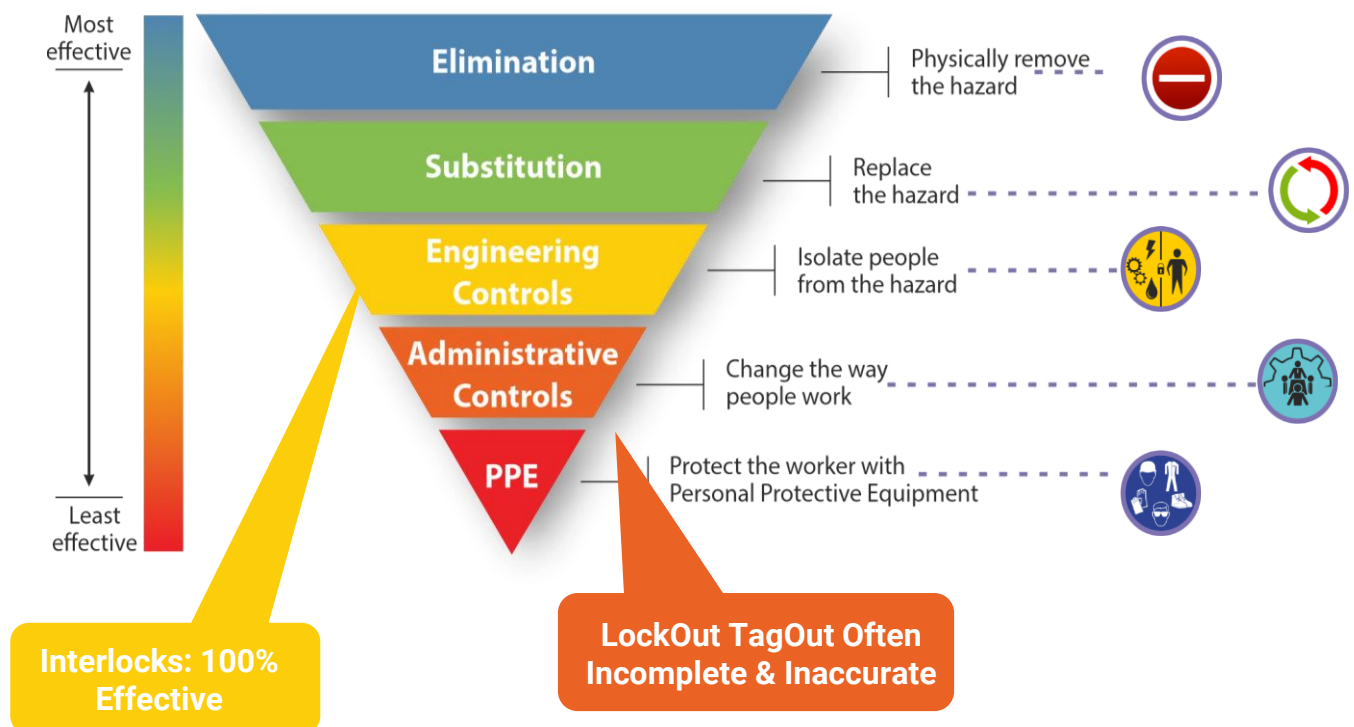
WHY TRAPPED KEY SOLUTION?

Engineering Control vs Administrative Control

Unlike LOTO, which is often bypassed or not enforced rigorously, the Trapped Key Interlock provides a fail-safe engineering solution. It eliminates the risks posed by human error, shortcuts, and unexpected machine startups.

By implementing this solution, even if there is an unauthorized entry, the machine cannot be restarted, ensuring the operator's safety.

Trapped Key Interlock is a proven reliable Engineering Control



CLIENT SUCCESS

- **Zero Harm Machine Operations:**

Incorporates a forced key extraction system with a mechanical actuator, ensuring the key is always removed after use and not left in the door, enhancing operational safety.

- **Accident Reduction:**

Accidents caused by shortcuts and unexpected machine startups were eliminated, improving safety and operator confidence.

- **Operational Continuity:**

Despite stringent safety measures, the solution allowed safe, controlled access for both minor and major maintenance activities without compromising productivity.

- **Scalable Safety Solutions:**

This system is now implemented across four additional slitter lines within the same tube mill, demonstrating its scalability and effectiveness.

- **Enhanced Safety Culture:**

The Trap Key Interlock solution has reinforced a strong safety culture, making safety a top priority and engineering it in the daily operations of our client.



Zero Harm Machine Operations



Accident Reduction



Operational Continuity



Scalable Safety Solutions



Enhanced Safety Culture

INSTALLATION STEPS

STEP 1

Key Switch Installation:

- Installed a “2 NC 2 NO bases key switch” at the local control panel.
- The machine remains powered as long as the key is trapped inside the switch.
- Removing the key puts the machine into jog mode (inch mode)

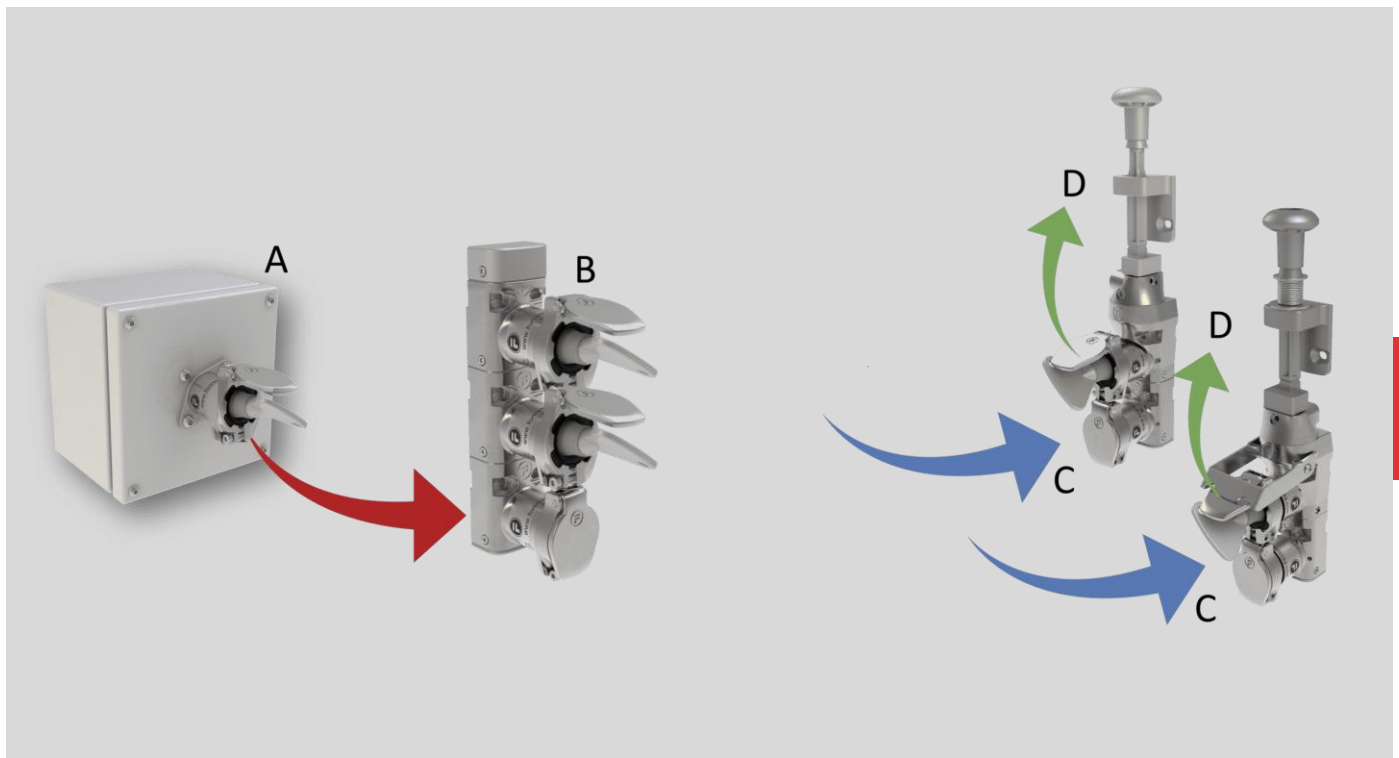


INSTALLATION STEPS

STEP 2

Key Exchange Module:

- The power key is transferred to key exchange module with three slots.
- Two trapped keys provide access to specific points.
- The third slot traps the power key, enabling access to other points.
- Currently, there are two access points, but the solution can be expanded to include several access points with an add-on feature.

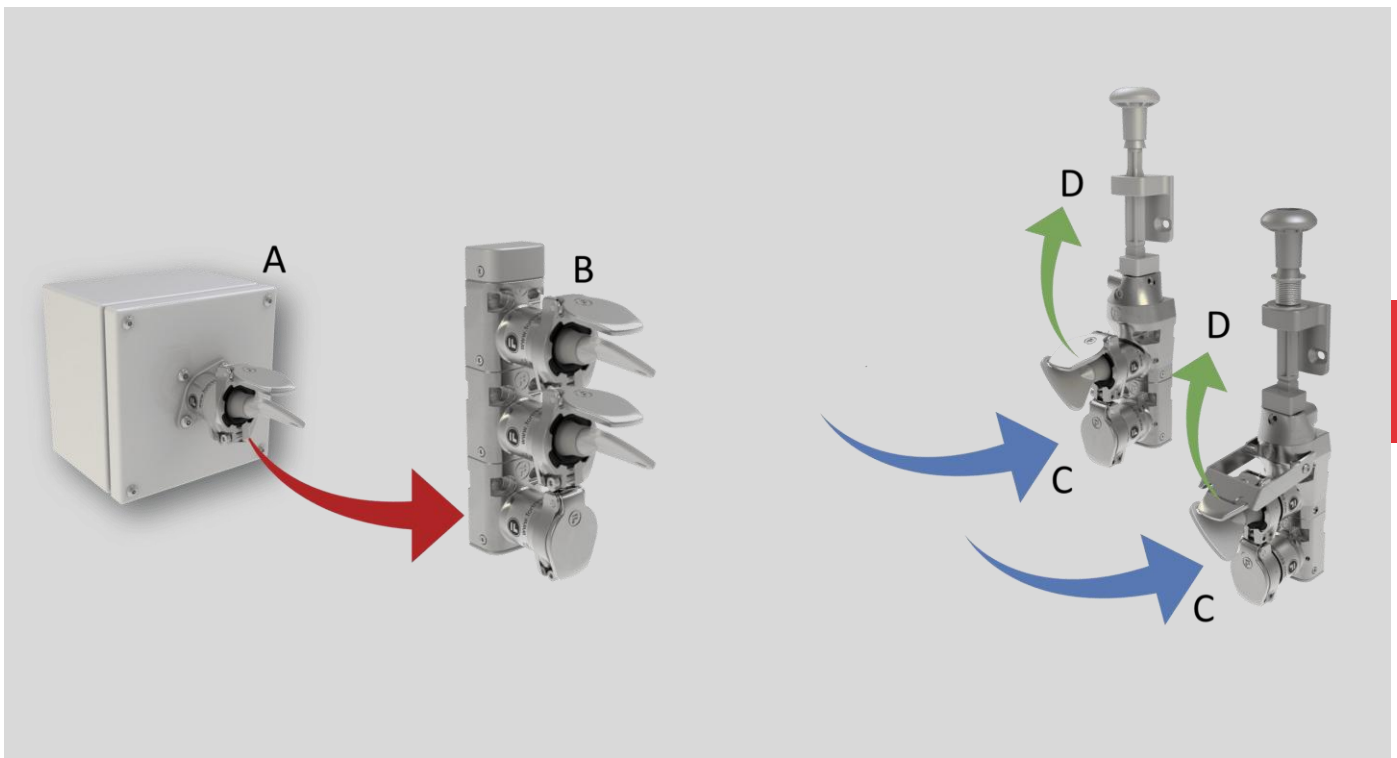


INSTALLATION STEPS

STEP 3

Door Lock Module at Access Points:

- A two-key door lock module is installed at each access step.
- The access key from the exchange module is trapped in the first slot of the door to open.
- Once trapped, the second key (i.e. personal safety key) is released, allowing the door to open.
- A patented safety feature of forced key extraction system with a mechanical actuator is inbuilt, ensuring the key is always removed after use and not left in the door.



KEY TAKEAWAYS

- **Fail-Safe Engineering Control:**

The Trapped Key Solution provides 100% reliable, fail-safe protection without disrupting productivity.

- **Standards Compliance:**

The solution meets stringent CAT 4, PL e, Level E safety standards, ensuring compliance across high-risk operations.

- **Collaboration between BRIGS and Fortress:**

The combined expertise brought to this solution underscores its industry-leading effectiveness.

CONCLUSION

By integrating the **Trapped Key Interlock** system, **BRIGS** has fundamentally transformed the safety culture within the recoiler and slitter areas, reducing both accidents and downtime. This engineered solution represents a critical shift from administrative controls to a robust, tamper-proof engineering control that ensures total compliance with safety standards.

The implementation has not only enhanced safety but has also improved productivity, setting a new standard for safe industrial operations.

This collaboration between BRIGS and Fortress underscores the powerful impact of engineering controls in fostering safer, more efficient industrial environments.

ABOUT US

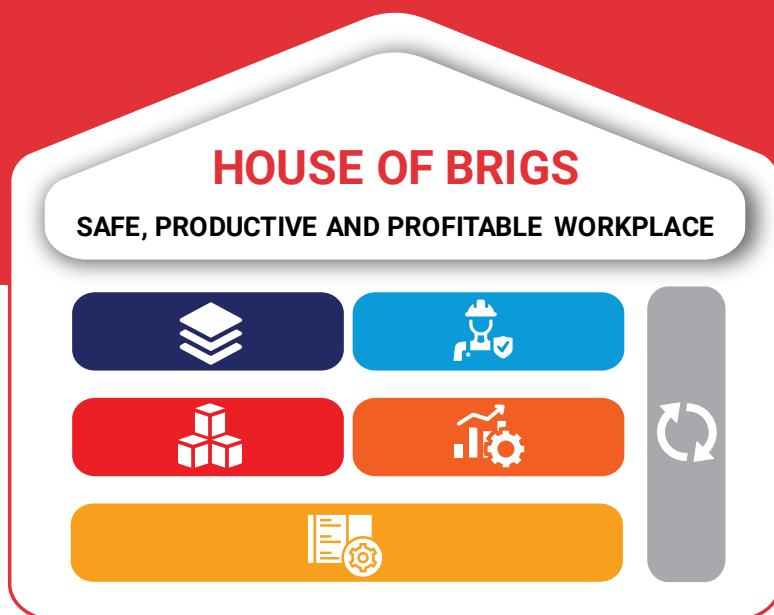
At **BRIGS**, we design innovative and sustainable safety solutions that protect both people and machines without compromising productivity. Our expertise lies in creating safer, more efficient, and fully compliant workplaces through advanced platforms like Factory U/X, Factory O/S, and M/P Safety.

With a mission to build secure and self-regulating work environments worldwide, our B11 Licensed Machinery Safety Specialist and Workplace Safety Experts, with a 360-degree overview of machine safety, offer comprehensive services across the entire machine life cycle. From risk assessments to compliance with international standards like ANSI B11.0:2010 and ISO 12100, we ensure that your workplace is safeguarded from operational hazards.

In partnership with Fortress, we have successfully collaborated to deliver cutting-edge solutions like the Trap Key Interlock System, enhancing workplace safety and setting new industry standards. Together, we are committed to making safety seamless and workplaces productive.

Every Life Matters!

Write to us - info@brigs-espro.com to Lock in Safety with a Trapped Key Interlock!



- | | | | |
|---|----------------------|---|----------------|
| 1 | Organized Workplace | 4 | Inventory Max |
| 2 | Safe Workplace | 5 | Matrix Display |
| 3 | Productive Workplace | 6 | Change RX |

BRIGS ESPRO SERVICES PVT. LTD.

Sy.no.339/2, Near MR Sports Arena, Marasur Gate,
Chandapura, Anekal Road, Bengaluru Urban, Karnataka-562106



+91-9902675521
www.brigsespro.com