

Lighting Plant Auto Start System

Zinifex Century Mine

The Problem or Initiative

Lighting plants are portable trailer units powering three, four or six lights on a ten-metre boom, driven by a fully enclosed motor. At Zinifex Century Mine, lighting plants are used to provide lighting that allows people to work safely at night in areas such as tip heads, shovels, intersections and corners.

Forty-five lighting plants are currently used at Zinifex Century Mine. They require teams of two or three people to manually start each plant every afternoon, a process that takes approximately 2 hours. The plants have an automatic shut down and do not require manual stopping.

Starting each of the forty-five lighting plants presents daily risk exposures to those involved. The primary risk exposure is heavy/ light vehicle interaction, which is magnified when starting these units because they are usually close to operating machinery.

Other risks also present themselves during the many steps required to start each lighting plant. These steps and their risk exposures include:

1. Excess traffic and increased heavy/light vehicle interactions created by people driving through the mine site to each lighting plant. If people are unable to find lighting plants easily, the time they are at risk increases.
2. Leaving light vehicles exposes people to the active working environment, resulting in exposure to dust, dehydration and heat stress.
3. Walking to and from the lighting plants across uneven ground risks slips, trips, sprains and strains.
4. Lifting the door to start the lighting plant risks manual handling, the pinch point and strain injuries.
5. Closing the door on the lighting plant also risks pinch point injuries.

The project team decided that automating the lighting plant start-up was the most effective solution to these risks.

The project team contacted both the original equipment manufacturers and the control system manufacturers to establish whether any automatic start systems were currently on the market. Extensive research failed to deliver a system that eliminated the identified risks and suited the Zinifex Century Mine site.

The Solution

To eliminate the identified risks, Zinifex Century Mine's Maintenance project team developed a project that designed and trialled a Lighting Plant Auto Start System for the lighting plants. The system was designed in-house and included safety assessments. The final innovation integrated effectively with the existing auto stop and engine protection systems.

The risk assessments conducted for the project identified a need for:

1. Cut out switches on lighting plant doors.
2. Cut out switches on lighting plant booms.
3. A siren and flashing lights that would activate immediately prior to lighting plant start up.
4. The flashing light was also set to operate in case of an out-of-plan shut down, which would eliminate further risk exposure.

A prototype Lighting Plant Auto Start System was developed and fitted to one of the lighting plants for a trial period. The system featured a number of operational and safety features. The electrical safety inclusions are:

1. A manual override facility as part of the fully automated system. Appropriate decals are fitted to the lighting plant to warn people about the automatic start function.
2. Safety switches fitted to the doors and boom prevent uncontrolled start-ups.
3. The flashing light will operate in the event of an unscheduled shut down. This will ensure that the lighting plant is visible and easy to find at night.

Normal start-on-demand operation is still available, so the original function of the machine remains unaltered.

Safety and operational features of the Lighting Plant Auto Start System mean that it will only work when:

1. The boom is raised.
2. The doors are closed.
3. The breaker is in the 'on' position (allowing lights to power up).
4. The key is in the 'auto start' position.

The starting sequence for the Lighting Plant Auto Start System works like this:

1. At a pre-determined start time (6pm), the siren and flashing light activate for approximately 20 seconds.
2. The lighting plant's engine starts, and the lights turn on after approximately ten seconds.
3. If there is an unscheduled shutdown, the flashing light will operate, ensuring that the lighting plant is visible and easy to find at night.

Some very minor challenges arose when manufacturing the prototype, for example, sourcing the correct switches. When these were dealt with, a trial of the system was conducted on one lighting plant for two months. The trial of the Lighting Plant Auto Start System was monitored daily and proved extremely effective. As a result, each of the 45 lighting plants at Zinifex Century Mine will be fitted with the Lighting Plant Auto Start System by the close of FY08.

Benefits/Effects

Zinifex Century Mine is realising a number of benefits from the Lighting Plant Auto Start System. The primary benefit is the elimination of the risks exposures originally presented by the manual start of all 45 lighting plants on site.

Risk exposures eliminated and reduced by the Lighting Plant Auto Start System:

1. Reduced general mine traffic and heavy/light vehicle interactions. The Lighting Plant Auto Start System is estimated to reduce vehicle interaction at Zinifex Century Mine by 545 hours per year.
2. Reduced exposure to dust, dehydration and heat stress.
3. Reduced likelihood of slips, trips, sprains and strains.
4. Reduced manual handling, the pinch point and strain injuries.
5. The unscheduled shutdown flashing light ensures that the lighting plant is visible and easy to find at night.

Additional benefits of the Lighting Plant Auto Start System:

1. The elimination of up to 2.5 hours of excess running time per day per unit.
2. Less diesel required to power lighting plants as a result.
3. Longer time spans between scheduled services of lighting plants.
4. Up to 6 work hours saved each afternoon.

Costs to the business of the Lighting Plant Auto Start System:

1. Development of prototype - \$2 500
2. Manufacture and installation per unit -\$2 500
3. Annual maintenance per unit is negligible
4. Total cost to develop and fit to fleet - \$112 500

Savings to the business equate resulting from the Lighting Plant Auto Start System:

1. A saving of \$3 077 per lighting plant annually (servicing) a net annual saving of \$138 465.
2. 64 250 litres of diesel worth \$96 375 saved annually.¹
3. 1460 hours of daily start-up labour (at a cost of \$90/hour) gives a cost saving of \$131 400 annually.
4. Reduced running time of 16 060 annually.
5. Total cost savings equate to \$366 240 annually.
6. Emissions reduced by 173 475 kg CO₂.

Transferability Across Industry

The Lighting Plant Auto Start System is easily transferred across industry, easily adapted to allow others to enjoy the benefits of lighting plant start-up automation.

The projects team's research suggests that the Lighting Plant Auto Start System may be best practice in its field. The Lighting Plant Auto Start System's capabilities and benefits will be further tested as the site-wide rollout is completed.

The system is also highly sustainable. It is safe, user friendly and requires minimal maintenance other than the standard maintenance scheduled for each unit.

¹ 64 250 litres of diesel @\$1.50/litre = \$96 375

Innovation

The Lighting Plant Auto Start System is an original product designed, developed and built for the lighting plants at Zinifex Century Mine. It is a response to the unavailability of a similar suitable product.

Dave McGrory devoted his own time to the success of the Lighting Plant Auto Start System by seeking advice from electrical businesses when in town on R & R. He canvassed different options and applications for switches and other components, and the best configuration to provide the most effective and reliable solution.

When the topic of lighting plant automation was discussed previously at Zinifex Century Mine, inherent risks that created barriers to innovation always came up. For example, if the lighting unit's engine ran out of oil it could cause costly damage and high repair costs resulting in no lighting for the affected area.

At the outset of the development of the Lighting Plant Auto Start System, all previously identified barriers were factored in to the design, development and implementation process. As a result, the prototype had hard engineering controls that provided in-built protection against identified inherent risks.

For example, the lighting unit is protected against the inherent risk of damage that would result from running out of oil by the installation of a sensor that shut the lighting unit down when it runs low on a vital component. Amber lights have been fitted on the lighting unit – they flash to allow easy identification of the area where the problem is.

A secondary protection is provided by a control that prevents the lighting unit from restarting until the cause of the stoppage has been resolved.

The innovation has not created any identified hazards since it began operating at Zinifex Century Mine.

Operation/Safety Features:-

The Lighting Plant Auto Start System will only start when:



- The boom is raised



- The doors are closed



Operation/Safety Features continued:-



- The breaker is in the "ON" position
- The key is in the "AUTO START" position



- Normal start on demand operation still available

Starting Sequence:-



- At a pre-determined start time (6pm), the siren and flashing light activate for approximately 20 seconds
- The lighting plant's engine starts, and the lights turn on after approximately ten seconds
- If there is an unscheduled shutdown, the flashing light will operate, ensuring that the lighting plant is visible and easy to find at night