DAYTON
PHOENIX
GROUP

engineered to move

# off-highway

# engineered to move

**Expertise** is where we began
**Quality** brought us to today
**Innovation** carries us forward

# Why partner with DPG?

Dayton-Phoenix Group offers solution-driven innovation for heavy industry's critical applications ensuring mine owners keep their haul trucks in service.

## We are solution providers to CAT, Komatsu, and Liebherr




Reliability and equipment up time is your concern and ours. That's why we developed a superior, drop-in grid hatch replacement to address the limitations of the Komatsu OEM system.

# Limitations of current OEM system

*Current **OEM** retarding solution.*

## Current OEM Design

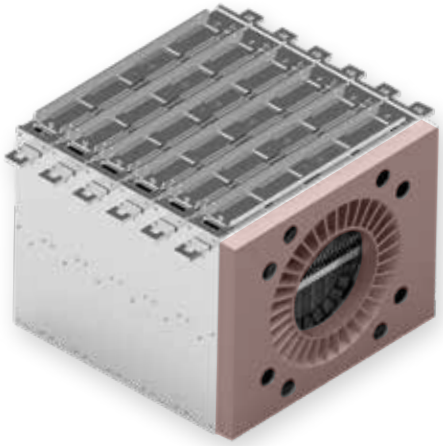
The current OEM retarding grid assembly lacks the necessary airflow distribution and cooling of the resistor elements, which leads to added maintenance costs and reduced life expectancy.

The resistor elements reach temperatures over 1,200°F and require sufficient air over-cooling. Without adequate airflow distribution, hot spots will form. This excessive heat degrades the insulation system, causing failures.

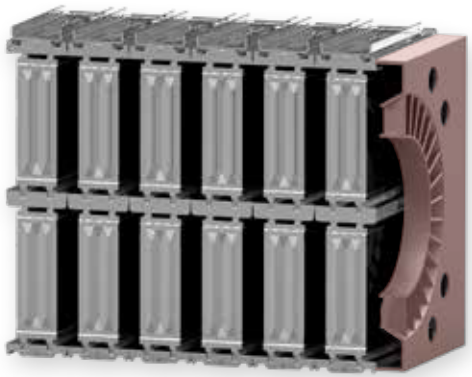
Due to the necessary retarding power, the OEM solution utilizes four banks of grids in the current layout. This system houses two DC motors driving four fans, all drawing from the same intake air.

# Airflow

Consistent airflow distribution across all four sections is required by design. **The four fans produce an annular airflow that does not match the rectangular design of the grids**. Each fan has blades with an inner diameter of 16.5 inches and an outer diameter of 24.0 inches. This column of air must be redirected across the 28.0 inch wide grids. In the OEM solution, this is attempted via a diffuser plate. However, the diffuser size and location to the fan outlets are not adequate to redistribute the airflow into the corners of the first two grids.

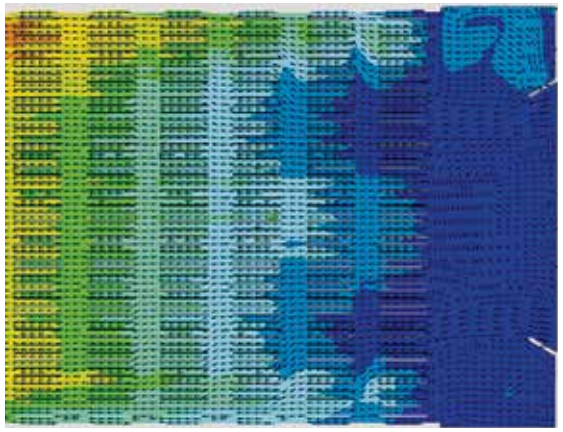


*Current **OEM** fan airflow **does not** match grid design. The added diffuser plate (shown in red) is not enough to redistribute airflow to the corners of the first two grids due to its size and location to the fan outlets.*

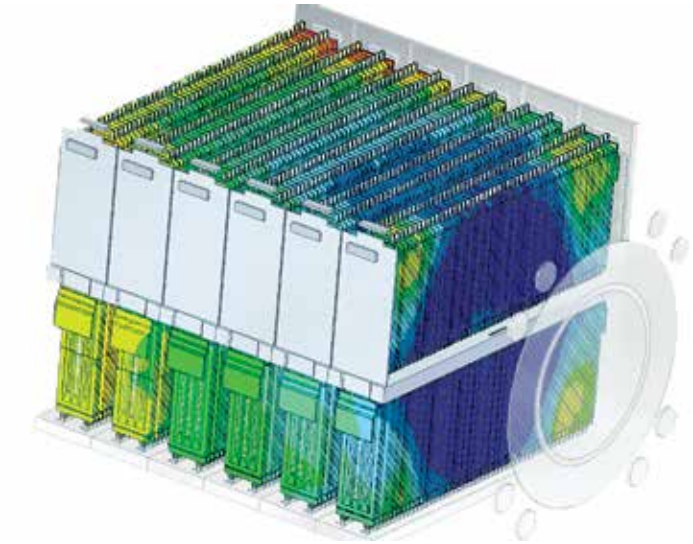


*Cross-section view of diffuser plate (shown in red) and grid elements.*

# Limitations of current OEM system



*Uneven airflow (see left) across the grid elements resulting in hot spots (see below) in the corners of the grid pack.*



## Airflow, *continued*

In addition, the stack of five to six grids increase static pressure in the system, creating a higher pressure drop over the last two grids, which decreases their effective cooling capability. These grids see earlier failures if not rotated within the stack.

This enclosed system also retains heat after the fans shut down and collects dirt, which has been known to impact system life. **For mine owners, this means increased downtime for servicing motors, cleaning, replacing and/or rotating the grids, and replacing the complete grid hatch assembly.**

# Limitations of current OEM system

## Air Intake & Discharge

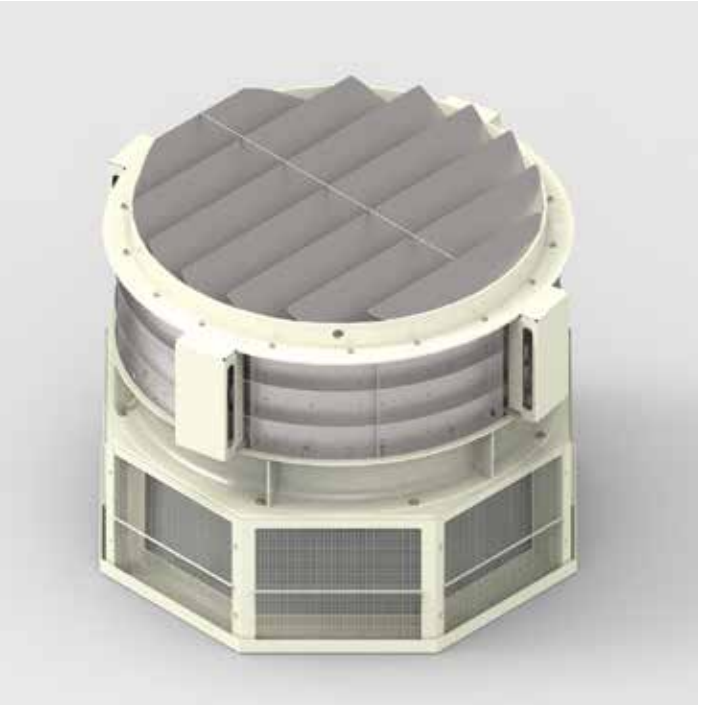
As mentioned, the four fans pull air from the top, bottom, and sides of the grid hatch. The air intake is reduced by the internal space limitation of the hatch design, requiring multiple 90° bends of the air. This is *not* ideal for a vane axial fan application.

The intake locations also allow recirculation of hot, discharge air from the back of the truck bed, which again, increases heat to the grids.

The discharge in the front of the grid hatch is also impacted by the ram air when the vehicle is traveling at higher speeds.

*The space limitation inherent with the current **OEM** grid hatch design reduces air intake and allows hot, discharged air to be recirculated, which is problematic for vane axial fan applications.*

# Aftermarket grid hatch replacement



***DPG**'s radial grid hatch system offers significant advantages over the current **OEM** solution.*

## DPG Radial Solution

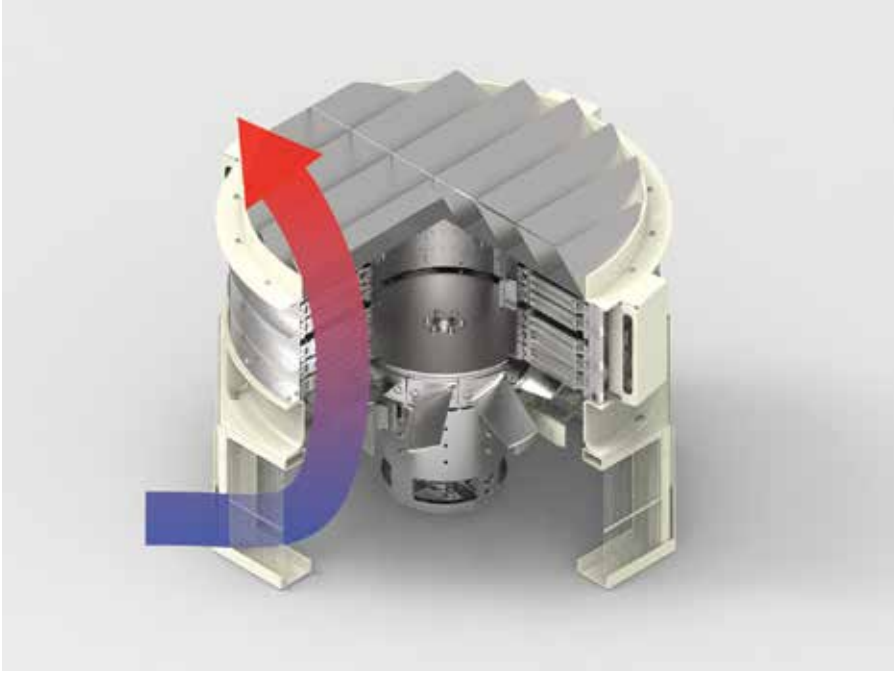
Dayton-Phoenix Group's solution utilizes a radial grid design offering proven superior performance. DPG has manufactured radial resistors since 1992, and radial DB systems since 2002.

Reducing the number of motors and distributing the airflow evenly across the grid elements provides a significantly longer-lasting solution, while also delivering the following key improvements:

- Weight reduction of 3,200 lbs.
- Lower lifecyle costs
- Continuous retarding power of 4.1 MW verses 2.4 MW for the OEM solution

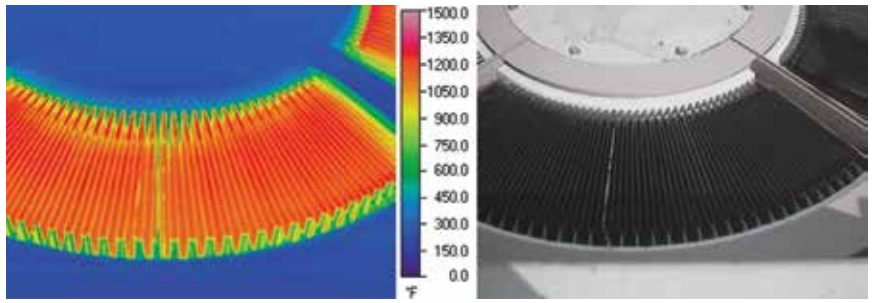
# Radial System Advantages

The DPG radial design places the resistor elements directly in line with the vane axial fan's annular air flow. Since this creates no hot spots, the steel elements are capable of higher temperatures, while keeping the insulator blocks cooler than the current OEM design. **This leads to a longer insulator life and overall reliability improvements.**

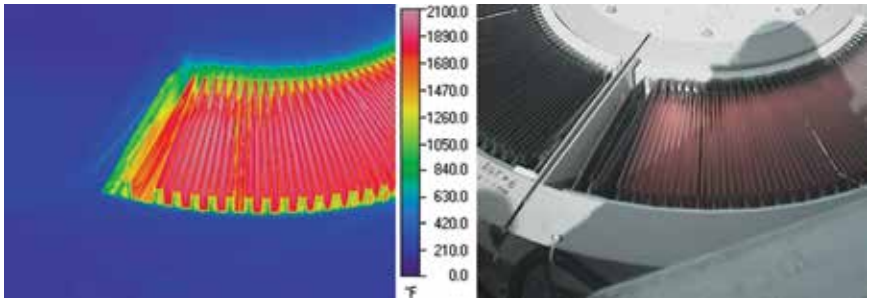


***DPG**'s radial grid hatch system optimizes airflow across entire resistor surfaces eliminating hot spots and increasing both insulator life and reliability.*

# Aftermarket grid hatch replacement




*Test photos and thermal imagery of a radial at full power.*




*Test photos and thermal imagery of a radial at 110% power.*

## Radial System Advantages, *continued*

In addition to the optimized airflow, the steel elements are engineered to keep the heat away from the edges where they come in contact with the insulators.

As seen in thermal imagery, the temperatures near the insulation material are nearly half the temperature across the element.

Even when applying 110% of rated power, the elements maintain an even temperature across the elements *without* formation of hot spots.

# Insulator Temperatures

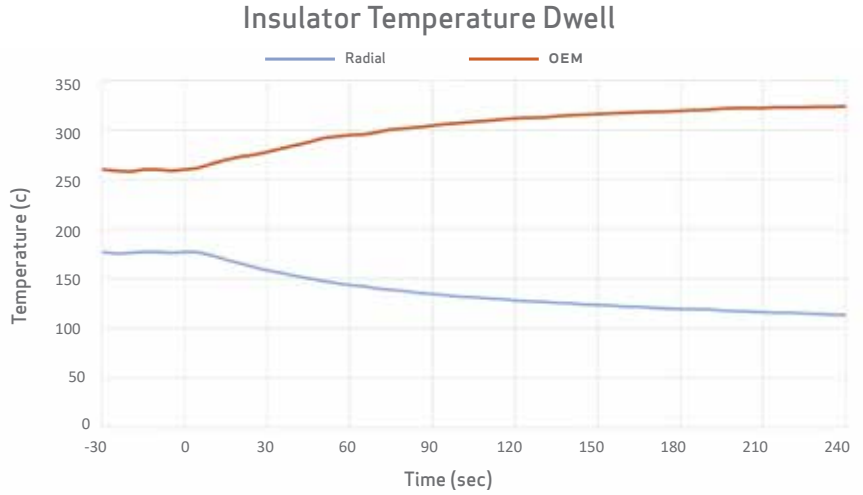
The insulator system is the weak link of a grid assembly, as high temperatures lead to loss of resin and eventual failure of the grid.

During operation, the radial design grid system allows for higher element temperatures, while maintaining insulator temperatures 32% less than the OEM design.

Once the retarder grid assembly is deenergized, the DC fan motor(s) immediately stop and the heat in the OEM design can not easily dissipate; this causes the insulator temperatures to continue to rise. With DPGs radial design, the vertical air flow allows latent heat to rise and quickly escape.

| System | Element Temp.°F | Insulator Temp. °F |
|---|---|---|
| Grid Hatch | 1,250 | 500 |
| Radial | 1,400 | 350 |

*The DPG radial design radially reduces insulator tempatures by more than 30%.*




*The graph displays the insulator temperatures of a radial vs. **OEM** system for four (4) minutes after power is cut to the resistors and cooling fan.*

# Aftermarket grid hatch replacement

## A solution you can trust

Dayton-Phoenix Group's aftermarket radial design grid solution solves the OEM design's airflow issue, providing longer life and reduced maintenance.

The radial design has been providing performance advantages in the OHV industry for 20+ years. These systems continue to show maintenance-free performance for over 90,000 truck hours.

Additional benefits include:

- **Lifecycle cost savings to the mine owner**
- **Increased equipment up time**
- **Reduced weight**
- **Higher continuous retarding power**

## Key Comparisons

| | DPG Radial System | OEM Grid Hatch System |
|---|---|---|
| Deck Space | 68" x 68" | 77" x 114" |
| Height | 53" | 47" |
| Weight | 3,270 Lbs. | 6,380 Lbs. |
| Motor | (1) DC<br>AC upgrade option | (2) DC |
| Fan Diameter | (1) - 54 inches | (4) - 24 inches |
| CFM | 45,000 CFM<br>per grid section | 14,000 CFM<br>per grid section |

# Aftermarket grid hatch replacement

## What does 1% do for you?

In the tough environment of mining, a 1% weight savings with Dayton-Phoenix Group's aftermarket radial braking grid design can make a significant impact. Compared to the less efficient and heavier OEM model, this reduction allows you to add **1.5 tons** more payload to each haul truck, boosting your productivity without compromising performance. The enhanced fuel efficiency and quicker cycle times with improved braking performance can also mean fewer trucks are needed in service, reducing both operational costs and fleet maintenance. This 1% weight savings helps make your mining operations more efficient, sustainable, and profitable.

**A mere 1% - a small change with a big impact.**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