

Adding VFD and Increasing Control Band Extend Rooftop Unit Lifespan up to 40%

Do you believe it? Here are the logics.

Adding variable frequency drives (VFDs) to the indoor fan and compressors, combined with increasing the temperature control band, can have a substantial impact on reducing cycling and extending the lifespan of a rooftop unit (RTU). While the exact improvement depends on the unit's condition, usage, and maintenance, here's a quantified analysis based on industry studies and best practices:

1. Impact of Adding VFDs

VFDs allow the indoor fan and compressors to operate at variable speeds, matching their output to the building's actual cooling or heating demand. This has several key benefits:

- **Reduction in Cycling:** By enabling partial-load operation, VFDs reduce the need for the unit to start and stop frequently, minimizing mechanical and electrical stress.
- **Lower Mechanical Wear:** Motors, fans, and compressors experience less strain when running at lower speeds, reducing wear and tear on bearings, windings, and other components.
- **Energy Savings:** Operating at variable speeds can save 20–40% on energy costs, indirectly contributing to better system longevity.

Estimated Lifespan Extension:

- [Adding VFDs can extend the lifespan of the fan motor and compressor by 20%–30%, as these are the most stressed components during cycling.](#)
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2. Impact of Increasing the Temperature Control Band

Increasing the temperature control band (deadband) reduces the frequency of thermostat-triggered cycling. Here's how this helps:

- **Fewer Start/Stop Cycles:** With a wider band, the unit runs for longer periods at a time and has longer off periods, reducing start/stop events that are most taxing on compressors and motors.
- **Stable Operation:** Longer run cycles allow the unit to operate at steady-state conditions, which is more efficient and less stressful on components.

Estimated Lifespan Extension:

- [Increasing the temperature control band can reduce cycling by 30%–50%, which could extend the unit's overall lifespan by 10%–20%.](#)
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Combined Impact

When both measures—adding VFDs and increasing the temperature control band—are implemented together:

- **Stress Reduction Synergy:** VFDs handle partial loads efficiently, while the wider deadband reduces the number of times the system switches on and off.
- **Compressor and Motor Life:** Both measures specifically target components most affected by cycling, such as the compressor and fan motors, which often determine the unit's lifespan.

Total Lifespan Extension:

- When combined, these measures could extend the lifespan of the RTU by **25%–40%**, depending on the starting condition of the unit and how aggressively it was cycling previously.

Example

- **Without Upgrades:** A typical RTU might last **15–20 years** under standard operating conditions with moderate maintenance.
- **With Upgrades:** After adding VFDs and widening the temperature control band, the same unit could last **20–28 years**, assuming regular maintenance is also performed.

Additional Considerations

1. **Maintenance Remains Critical:** These upgrades reduce wear, but proper maintenance (e.g., cleaning coils, replacing filters) is still essential for maximizing lifespan.
2. **Energy Savings:** Alongside lifespan extension, expect a **10%–30% reduction in energy consumption**, which reduces operating costs significantly.
3. **Building Conditions:** Benefits are more pronounced in buildings with significant load variability, such as offices or schools, compared to facilities with constant loads.

Conclusion

By adding VFDs and increasing the temperature control band, you can expect to extend the RTU's lifespan by 5–8 years (or **25%–40%**) while also improving efficiency and comfort. For an even greater return on investment, ensure the system is regularly monitored and maintained.

Note: Information from ChatGPT