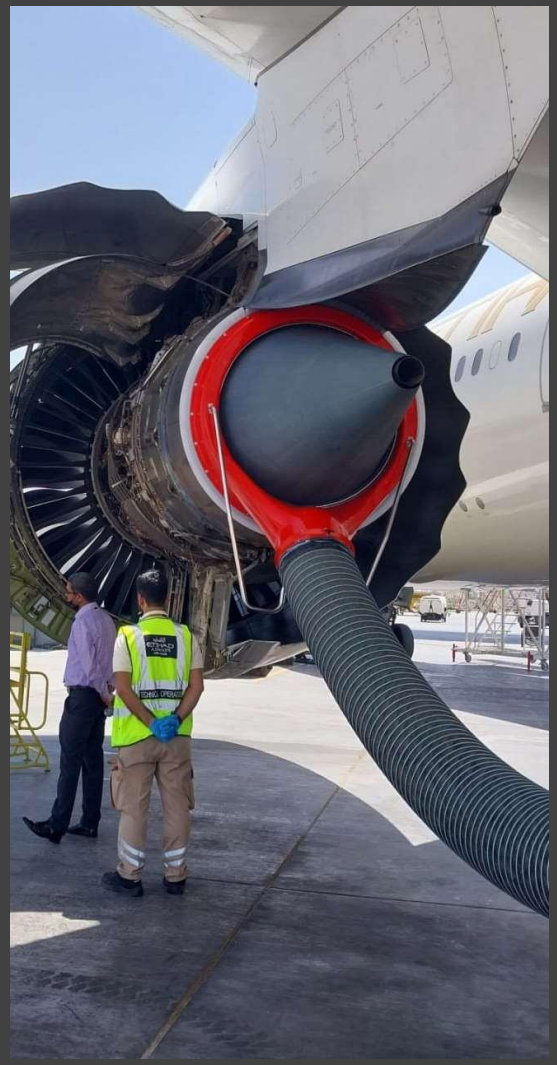
FCS

FINLAND

FCS FINLAND LTD

PROFESSIONAL JET ENGINE COOLING SYSTEM



FCS FINLAND LTD

- FCS Finland Ltd was established in 2018.
- Our company provides jet engine cooling solutions for aircraft maintenance operations.
- Our main goal is to provide equipment to save time and money in the aircraft maintenance.

TECHNOLOGY AND BENEFITS

- Our patented flagship products are AFC-22 ans AFC-23 cooling devices.
- The proven technology uses a vacuum to pull heat out from engine´s exhaust pipe to cool down the core and case. Ambient air flows through the engine´s flow path. This shortens the cooling time required which enables borescope inspection to be started earlier.
- The device is very simple to use and does not require any special certifications for the maintenance personnel.
- This saves the valuable Air Starter Unit, because no engine cranking is required to cool down the engine.
- Provides maintenance cost/manpower savings and increased aircraft utilization potential.
- Carbon footprint reduction.

SPECIFICATIONS – AFC-22 DEVICE

Voltage	360-500V
Current	16 A – no max
Cables	As ordered
Frequency	50-60 Hz
Suction speed	37 ft/s
Suction Power	49.44 ft^3/s 0.072 psi

AFC-22 DEVICE MEASURES

	EU	US
Device Width	1320 mm	52’’
Device Length	3383 mm	133’’
Device Height	1200 mm	47’’
Device Weight	595 kg	1594 lb

Adapter material	Fiberglass / heat resistant silicone seal
Hose material	Steel re-inforced / flame protected fabric hose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Professional cooling equipment for aircraft engines

SPECIFICATIONS – AFC-23 DEVICE

Voltage	360-500V
Current	Works from 16 A – no max
Cables	As ordered
Frequency	50-60 Hz
Suction speed	37 ft/s
Suction Power	49.44 ft3/s 0.072 psi

DEVICE AFC-23 MEASURES

	EU	US
Device Width	1873 mm	73 47⁄64“
Device Length	4837 mm	190 7/16“
Device Height	1066 mm	41 31⁄32“
Device Weight	1050 kg	2314 lb

Available with diesel or gasoline powered generator

Operating time	~20 h*

CONNECTING HOSE

Inner diameter	397 mm	15 5/8“
Length	6000 mm	236”

* Depends on e.g.; weather conditions, fuel tank level etc.

AFC-23 IN ACTION

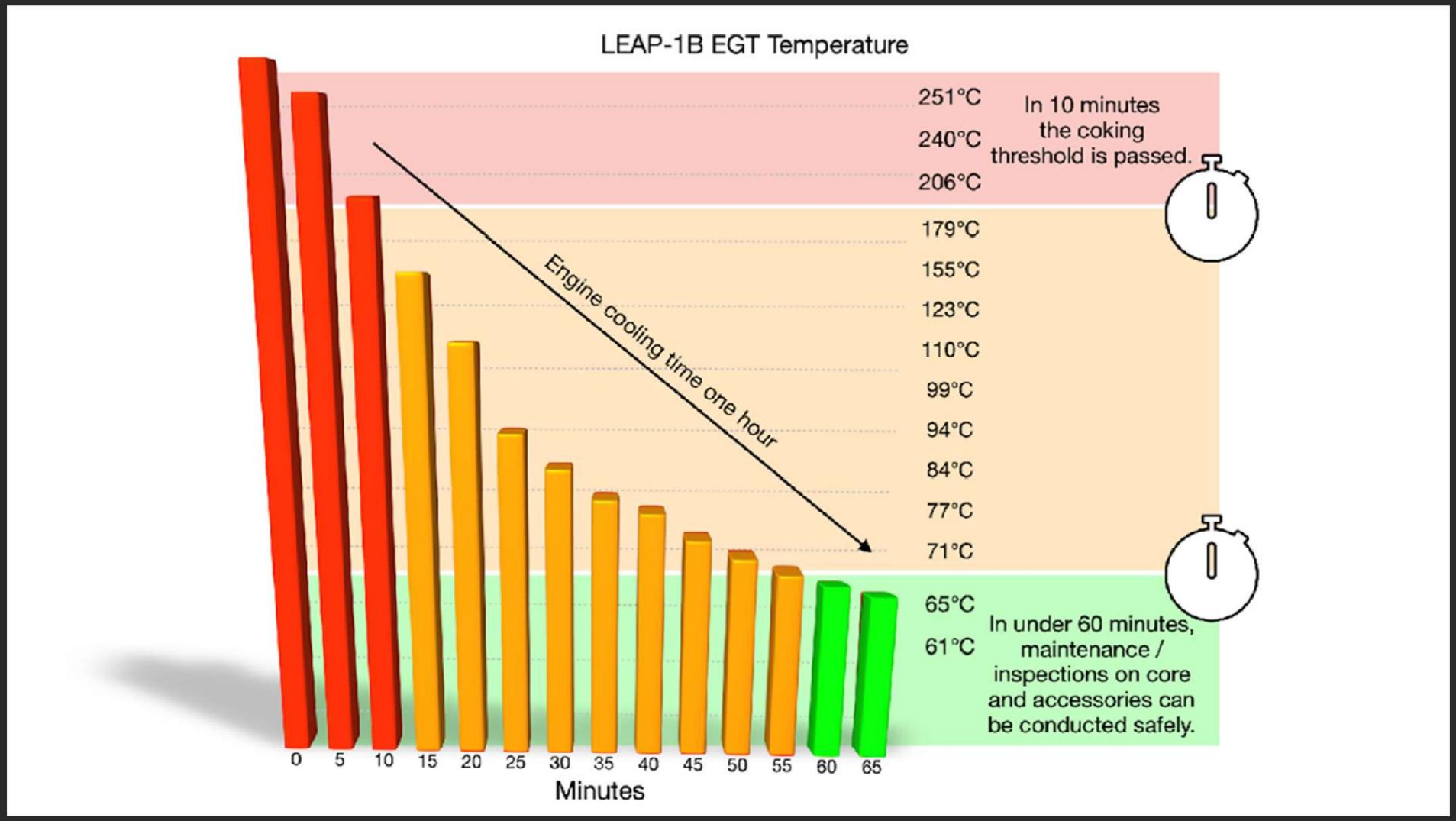
ADAPTER RING

Currently we have adapter rings available for the following engine models:

- CFM International CFM56-5B
- CFM International CFM56-7B
- CFM LEAP-1A
- CFM LEAP-1B
- General Electric CF6-80E
- IAE V2500
- Rolls-Royce Trent 800
- Rolls-Royce Trent 1000
- Rolls-Royce Trent 7000
- Rolls-Royce Trent XWB
- GE 90-115B
- GEnx
- B&W 1100
- B&W 1500

SURFACE TEMPERATURE DIFFERENCE AFTER 50 MIN COOLING

OPERATE SAFELY IN 1 HOUR

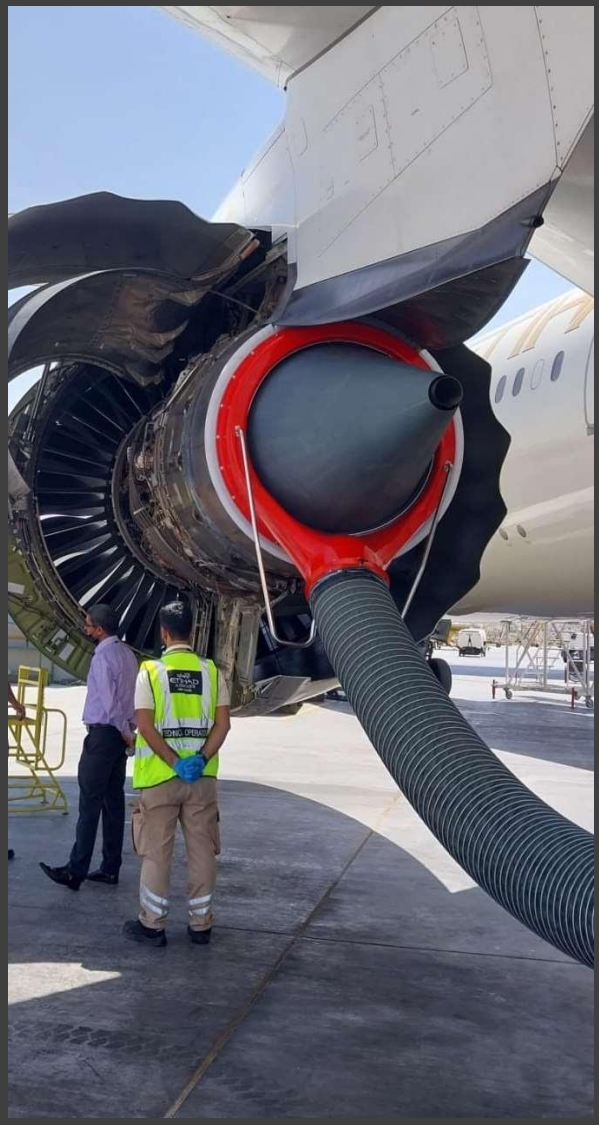


QUANTIFICATION OF CARBON REDUCTION / COKING MITIGATION

$C0_2$ Footprint/Coking Mitigation Benefit

- LEAP-1B $C0_2$ emissions vary during flight envelope
- Emission rate highest during taxi and ground cooling
- While EGT is above 200C carbon outgassing is high while coking occurs
- The engine produces 30KGs per hour in this phase
- Test proves device cools engine below 200C in 10 minutes versus 1 hour of ambient.
- Reduces carbon emission per engine by at least 25 Kgs per engine shutdown

Source: Analysis of Boeing 737 MAX Flight in terms of the exhaust emission.
International Conference on Air Transport 2019



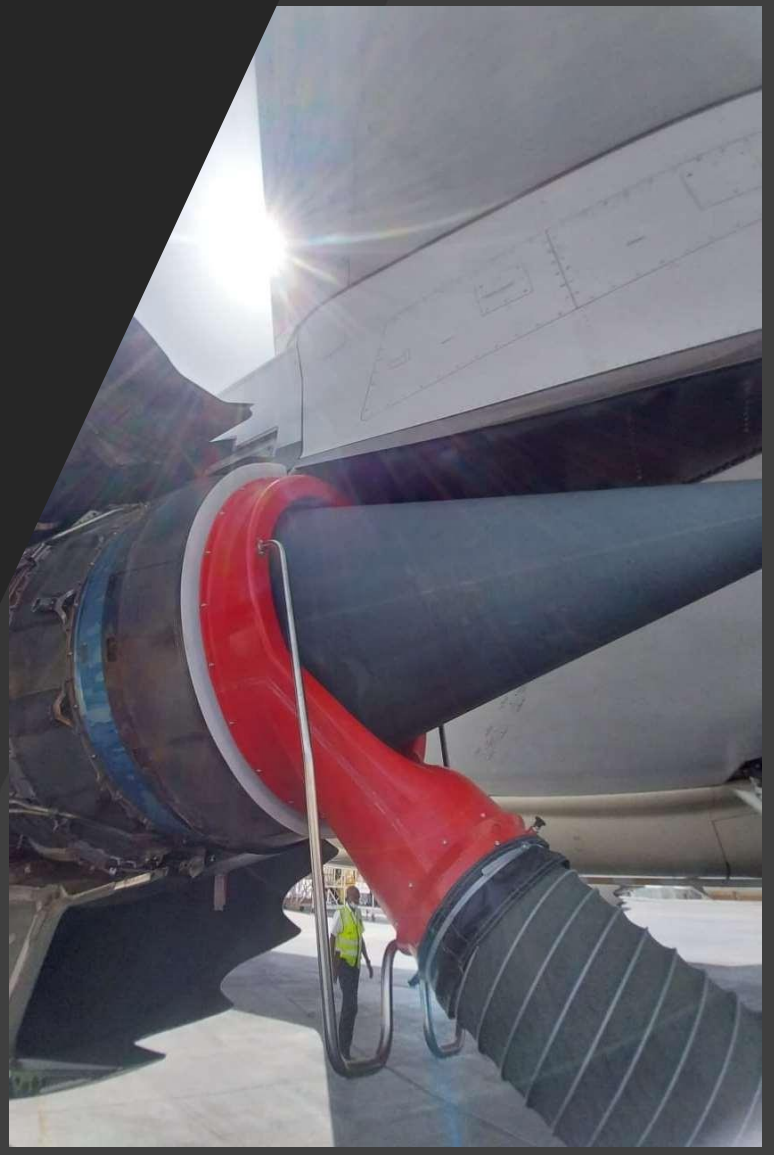
INSPECTION MAINTENANCE SAVINGS FROM ENGINE COOLING QUANTIFICATION

With FCS device hot section maintenance (e.g., borescope inspections) can be started in 40 min, when cooling started.
With passive cooling it would take about 4-5 hours.
This has been verified at Finnair/Delta/Southwest/United and the time saving ratio is roughly 1:4.

Assumptions:
Burdened labor rate of $85 per Hour per AMT
15 BSI events per year per engine
2-man BSI crew
Applied time cost savings of $7,650 per engine

737Max generates $150,000 per day assuming 6 cycles 2-hour stage
$12,500 per hour
Cooling provides up to 3-hour time benefit for aircraft utilization
Recovered available utilization pr aircraft $37,500

Note: Without repetitive requirement of AD 2020-0601
Ref: “Boeing 737MAX- How much could grounding the fleet cost the company” The Conversation US, 2019



PROPOSED USAGE AND NUMBER OF DEPLOYED UNITS

- Deployment varies by fleet type, utilization, and inspection frequency/limits.

- We recommend 2 units per BSI inspection site/designated station.

- FCS recommends employing the device for carbon footprint reduction credit.

3RD Generation model

AFC-22 UNIT RELIABILITY

Two-year extendable warranty

There have been no quality issues, malfunctions or failures , after two years continuous operation. The cooling unit itself (AFC-22) is durable and the current model is already in the 3rd generation.

The adapters sealings are replaceable.

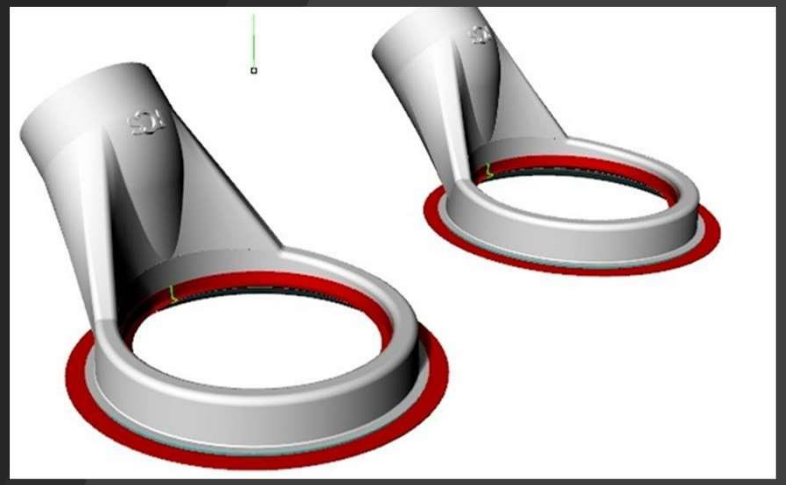
For the storage of AFC-22, no case or shroud is needed. Adapters should be stored in the horizontal position without causing stress for the sealings. There is a storage trolley available for the adapters.

PRODUCTION CAPABILITY AND SCALING

From the beginning, we have been aiming for high capacity in production planning. Our subcontractors operate 24/7.

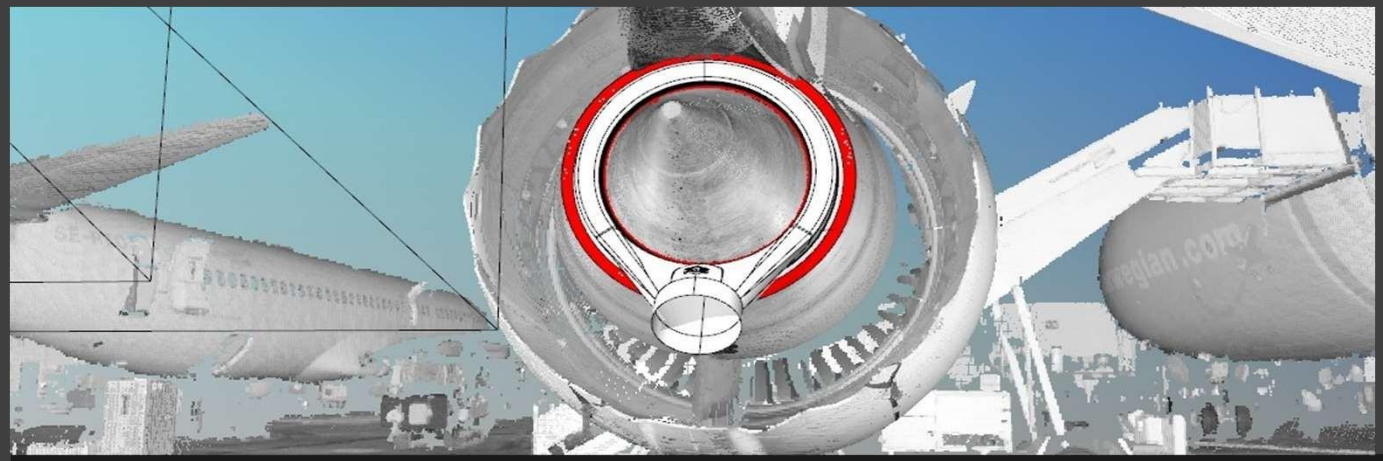
We can build custom-made adapter rings for any engine type.

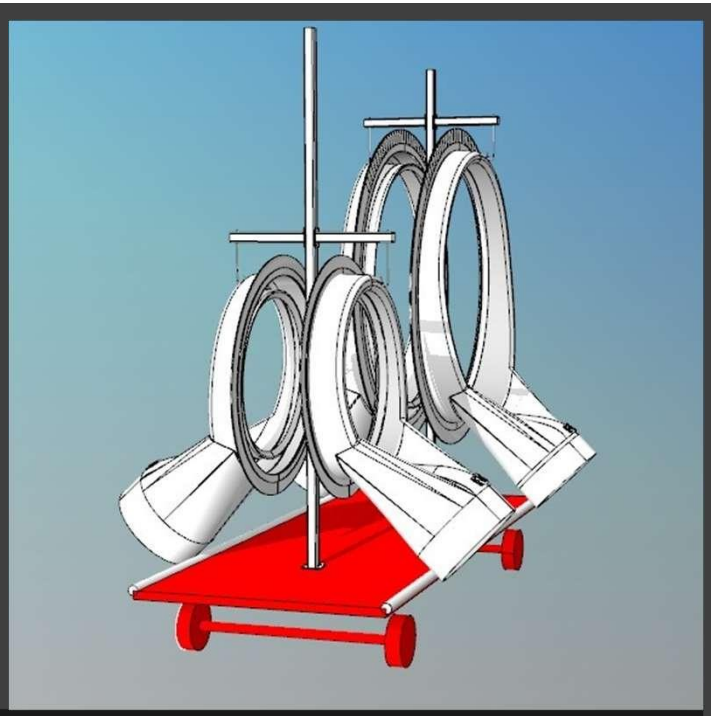
3D scanning is the key to quickly get accurate measurements for the purposes of manufacturing an adapter. The rest of the AFC-22 device is the same. We can adjust the RPM of the cooling fan to fit airflow for the engine type to prevent axle rotation, if required.



- **AFC-22 / AFC-23 delivery time, if not in stock 10 weeks**
- **Nozzle delivery time if in our collection 3 weeks**
- **If a completely new Engine Type (10 weeks)**

PRODUCT IMPROVEMENT AND CUSTOMIZABLE PRODUCT





FCS Finland is very committed to do continuous development. Customer feedback is valuable to us, and we try to do our best to make this product as good as possible.

We have already integrated customer suggestions into our design-robustness for mechanical tug.

We have dual hose and low-boy models in development based on airline feedback.

EASE OF USE AND MOBILITY

- The device is towable
- The device operates on any 3-phase electricity
- AFC-23 is available as a hybrid version with a diesel or gasoline powered generator and electric input
- Mating power adapters supplied with unit

“We are pleased with the ease of use and durability of the unit, and the AMTs love it.”

– Nick, Powerplant Engineer, Major US Airline