

CK Resolution Background

Issues: Current Brigade Military Table of Organizational Equipment (MTOE) issued Containerized Kitchens (CK) are inefficient and can be dangerous to the users.

- Appliances are run using the Modern Burner Unit (MBU), open flame vaporizing burner technology
 - Burners use open flame
 - Soldiers can easily come in contact with flame
 - Open flame/poor combustion produces high levels of carbon monoxide that must be cleared by the ventilation system. Simple failures in ventilation system can cause dangerous CO levels w/in the shelter.
 - Large volumes of heat are introduced to the shelter, not the food
 - Burners can only run clean JP8
 - Burners have no thermostat controls; manual low to high and on or off
 - Excessive heat is passed to the appliances and surrounding areas creating burn hazards
- HVAC
 - System uses two ECU's run by 10KW generator
 - This system is still unable to sufficiently cool the unit in hot environments (50°F heat rise over ambient).

Solutions: Need system that provides cooler working environments, eliminates CO poisoning risk, reduces fuel consumption, can run on multiple fuels, can be easily supported logistically and is not an expensive developmental project.

- Babington Airtronic burner and appliances
 - High efficiency combustion that creates little to no CO thus eliminating risk from failed ventilation system
 - Closed combustion that does not waste heat or heat surrounding areas.
 - Burner can be modulated to use only the needed fuel and generate only the needed heat
 - Multi-fuel capability (Diesel or JP8 as well as most other distillate fuels)
 - Burner can handle contaminated fuel
 - Lower fuel burn rate
 - Can handle contaminated fuel
 - One modular burner for all appliances
 - Already in use by the DoD since 1995
 - USMC
 - Tray Ration Heating System (TRHS)
 - Expeditionary Field Kitchen (EFK)
 - M59 Field Range
 - Army
 - Assault Kitchen (AK)
 - Air Force
 - Single Pallet Expeditionary Kitchen (SPEK)
 - Field Sanitation Unit (FSU)
 - Air National Guard
 - Disaster Relief Mobile Kitchen (DRMKT)
- AAR shelter
 - Better layout for efficiency
 - High-dome canvas to move heat away from soldiers until ventilated
 - System can maintain ambient conditions w/o ECU reducing fuel usage for generator and possibly allowing solar/wind in the future
 - Airbeam allows quick set up – can be inflated from ground on prime mover.
 - No secondary strut kit to hold canvas up (no lost parts, less weight).
 - Quieter operation
 - Helps meet Army ES² requirements Goal 2: Optimize Use



Containerized Kitchen – Enhanced (CK-e)


August 2016 Field Testing.

NGAUS Army Sustainment Task Force Presentation

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August 2017 Field Test

During the week of August 14, AAR & BTI performed a side by side test of their CK-Enhanced kitchen (CK-e) and the standard CK. Both shelters were instrumented and troop support meals were cooked during annual training. The prototype shelter reduced interior temperature, noise, fuel burn and CO exposure risk. The data presented represents a standard CK with ECU's and fan running. **The CK-e was tested WITHOUT ECU's or vent fans**



August 2017 Field Test - Side by Side Testing



August 2017 Field Test – Interior



CK-e

CK



August 2017 Field Test - Instrumentation



CK-e

CK



August 2017 Field Test – Closed Combustion vs Open Combustion

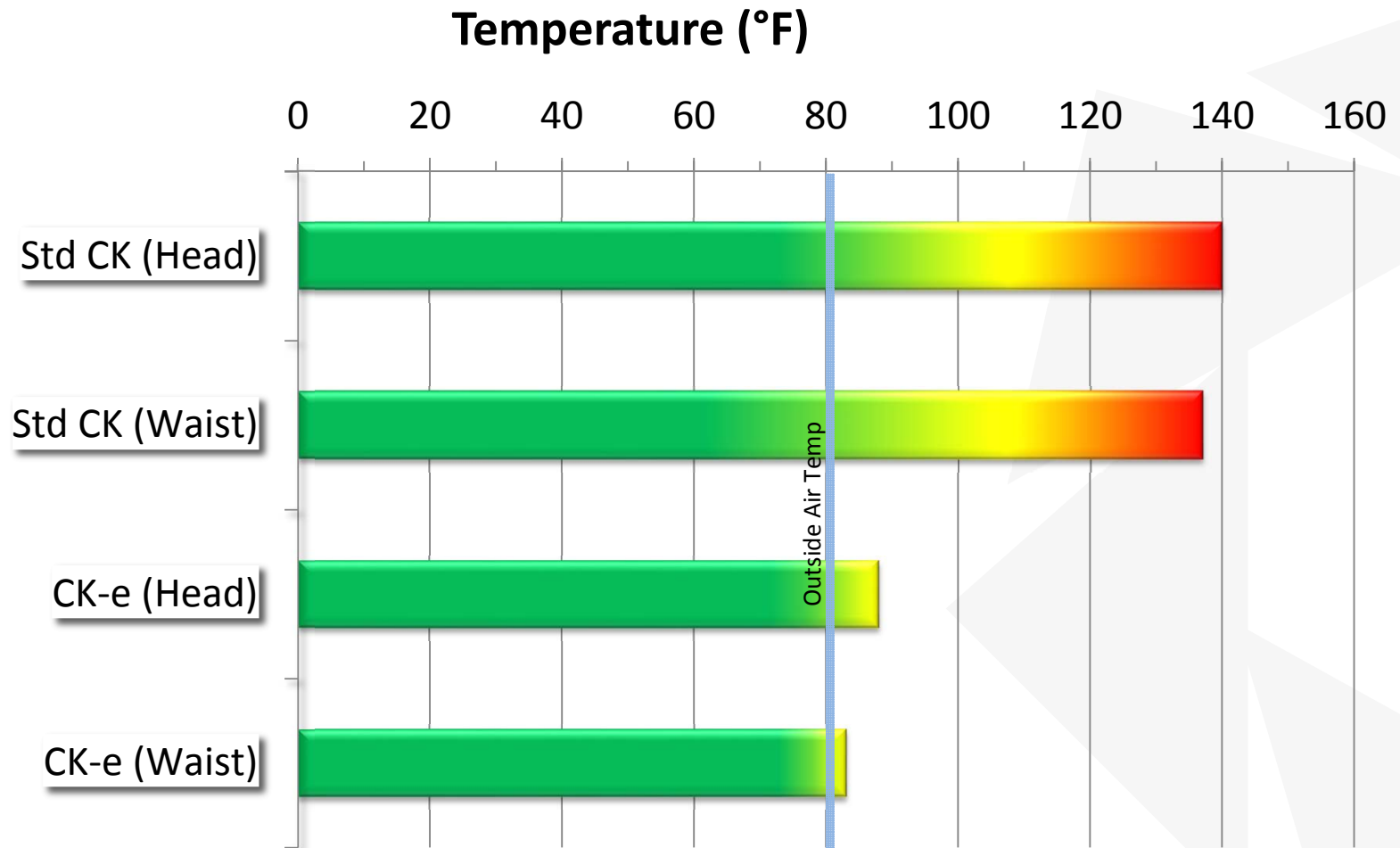


Babington Burner



MBU

Operational Temps Can Be Reduced

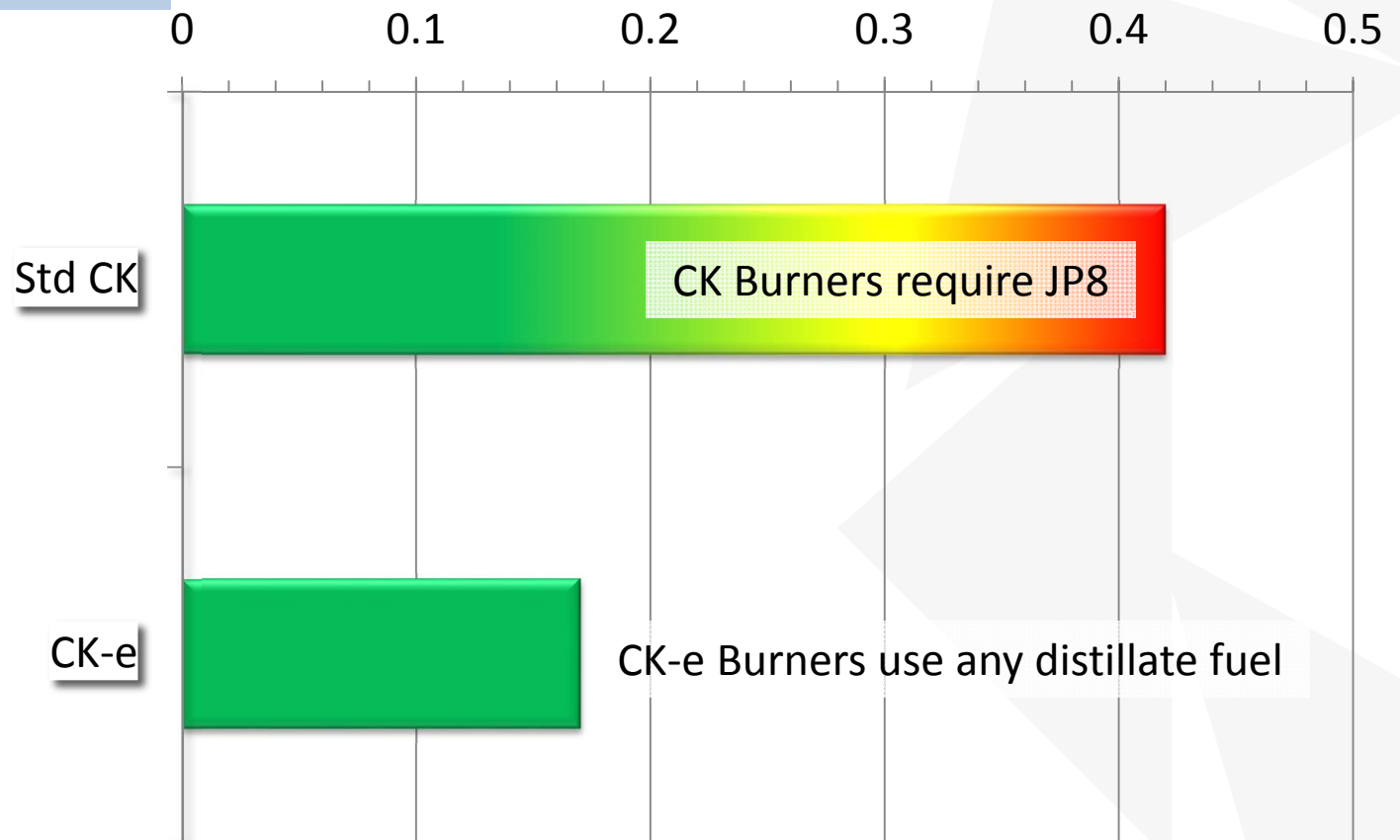


Fuel Usage Can Be Reduced

More testing needed to determine accurate comparison scenario

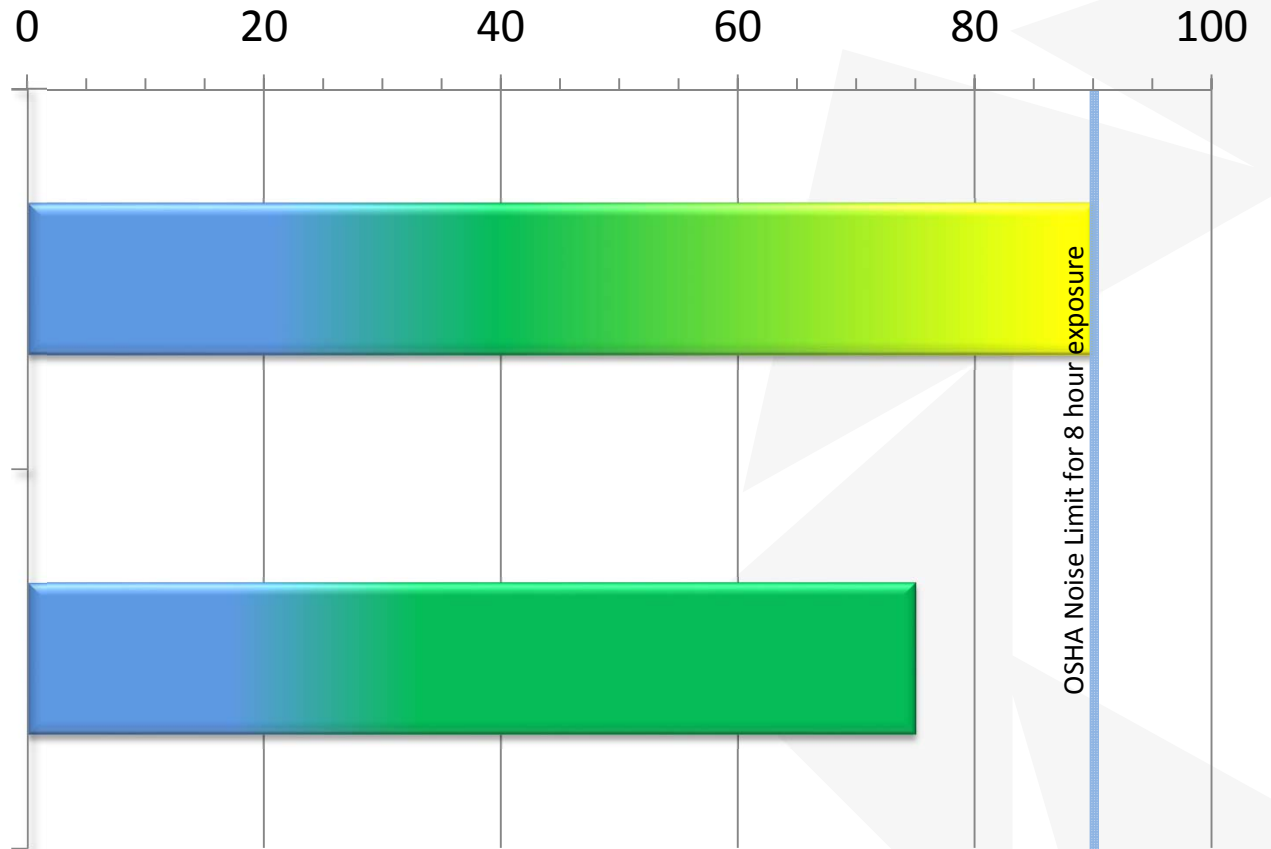
- CK burners must be tuned ON or OFF
- CK-e burners are thermostatically controlled

Preliminary Fuel Burn - Oven (gph)

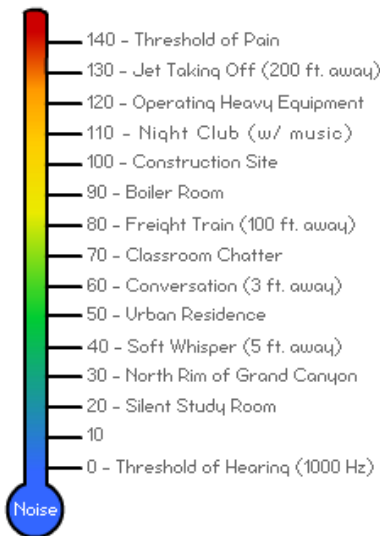


Noise Can Be Reduced

Noise (dbA)

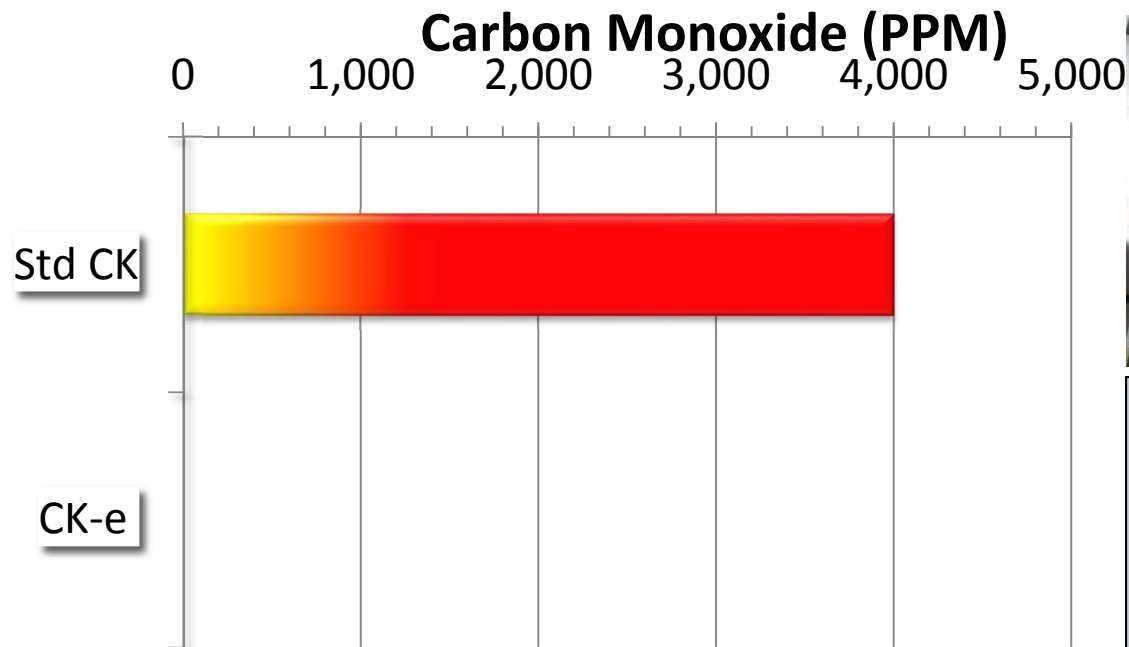


Typical Sound Levels (dbA)



CO Exposure Risk Can Be Reduced

Concentration	Symptoms
35 ppm (0.0035%)	Headache and dizziness within six to eight hours of constant exposure
100 ppm (0.01%)	Slight headache in two to three hours
200 ppm (0.02%)	Slight headache within two to three hours; loss of judgment
400 ppm (0.04%)	Frontal headache within one to two hours
800 ppm (0.08%)	Dizziness, nausea, and convulsions within 45 min; insensible within 2 hours
1,600 ppm (0.16%)	Headache, increased heart rate , dizziness, and nausea within 20 min; death in less than 2 hours
3,200 ppm (0.32%)	Headache, dizziness and nausea in five to ten minutes. Death within 30 minutes.
6,400 ppm (0.64%)	Headache and dizziness in one to two minutes. Convulsions, respiratory arrest, and death in less than 20 minutes.
12,800 ppm (1.28%)	Unconsciousness after 2-3 breaths. Death in less than three minutes.



During the test, a vent fan in the CK failed, allowing CO levels to rise to 4,000 PPM. The Babington burner produces near **ZERO** carbon monoxide thus **eliminating exposure risk**

Army Website Article: *“Beans and Bullets – finding new ways to feed the force”*

<https://www.army.mil/article/173319>

"With this set up, we can knock out the food, move on, and find ourselves ahead of schedule, " said Sgt. 1st Class Mark Shaw, Headquarters and Headquarter Co., 136th Military Police Battalion. "We would not have made mission today without it."

"We cooked 600 of the 800 portions for breakfast in the new kitchen and 200 in the other kitchen," said Shaw, "and the new one won, hands down."

The contractors have had a constant thermometer in here," said Shaw. "During what I like to call full burn and turn, with the oven cabinet, warming table, and griddle going, it was 89 degrees in here. In the CK, during full turn and burn, it's 150 degrees on the wet bulb."

"I'm retiring, so I'm not going to see any of this stuff in use," said Shaw, "but my son is coming into the military. I've got a personal reason to want everything better, as well as professional reason. If I feel like I can look back and I actually did something that made a difference, hey, life's good."

The equipment efficiency isn't just a cost-saving measure, said Shaw. It also translates to Soldier efficiency, allowing cooks to better balance technical proficiency with tactical training.

"More times than not, cooks have to be exempted from training," said Shaw, "because you can't leave the kitchen with something cooking- it's a fire hazard, but what does that do for Joe when he's supposed to be at a range, or needs extra practice with primary marksmanship training or medical training? You can run 100 different training scenarios, but nothing exempts him from being there with the cooking food."



GOAL 2: Optimize Use

Minimize demand and increase both efficiency and recovery to maximize resource and mission effectiveness for systems, installations, and operations.

The Army will improve productivity by reducing resource demand, investing in increased efficiency or enhanced recovery, and switching to renewable resources. Improved resource use can increase security and reduce expenses. We will minimize our environmental impacts from systems, installations, and operations by using natural resources more productively.

CK-E = GOAL MET!