Case Study –
Reducing Premature Failure of Parts with Interactive Virtual Training for Generator Operators

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Erik Kaas
Director, Product Management
NGRAIN Corporation
ekaas@ngrain.com
Agenda

- Training Challenges
- Virtual Maintenance Trainers
- Case Study – 3kW Tactical Quiet Generator
- Conclusions
Common Challenges in Training

- Some tasks cannot be trained, due to expense or lack of access to equipment

- Soldiers receive limited training before being deployed: task-based, on-the-job training is critical

- Training budgets are limited, yet training demand is increasing

- Total Package Fielding requires rapid and effective New Equipment Training
Learning Theory

Students Remember

- 10% of what they **read**
- 20% of what they **hear**
- 30% of what they **see**
- 50% of what they **see and hear**
- 70% of what they **say or write**
- 90% of what they **do**

Source: Airbus/Journal of Civil Aviation Training (Issue 1, 2006)
Training Methods

- **Text**
  - Low cost
  - Easy to create and update
  - Anytime, anywhere access
  - Low learning effectiveness

- **Multimedia**
  - Low cost
  - Easy to create and update
  - Anytime, anywhere access
  - High learning effectiveness

- **Hard Trainers**
  - High cost
  - Difficult to create and update
  - Limited access

- **Live Equipment**
  - Low cost
  - Easy to create and update
  - Anytime, anywhere access
  - High learning effectiveness
Virtual Maintenance Trainers

Virtual 3D equipment simulations to:

- Familiarize
- Acquire
- Practice
- Validate & Test

Proven ROI: Train 60% Faster
Benefits of Virtual Maintenance Trainers

✓ Let students learn from their mistakes, **safely**

✓ Let training take place **without** the expense of equipment

✓ **Reduce wear and tear** on equipment

✓ Enable **task-based, on-the-job training**

✓ Students are more engaged and **motivated**
Case Study: 3kW TQG Operator Course

Challenge: Premature failure of generator parts due to operator error

Objective: Provide more effective refresher and sustainment training

Results: Reduced premature failure of parts
Case Study - Implementation

Based on Technical Manual
- Cross reference
- Follow the procedure

Visual & Interactive
- Engage students
- More intuitive explanations
- Validate & test

Computer Based
- Used by instructor
- Used by students
- Used by deployed soldiers to refresh or just in time training
Case Study - Demonstration

Course Layout
Component Familiarization
Controls
PMCS
Operating
Troubleshooting
INTRODUCTION
Welcome to During Operation lesson. This lesson reviews the PMCS procedures for during operation of the generator set. This lesson reviews the procedures you need to conduct while the generator set is running.

Remember to refer to Table 2-1: Preventative Maintenance Checks and Services located in the Operator’s Unit, and Direct Support Maintenance Manual for a complete guide to PMCS procedures to perform during operation of the generator set.
Component Familiarization

Step 1: Click on each component to view its part on the 3kW Generator.

Major Components:
- Enclosure
- Hinged cover
- Skid base
- Vibration Isolators
- Battery
- Engine

Step 2: Take a comprehensive quick check on what you just learned.

Part Descriptions:
Isolates engine-generated vibrations from the rest of the generator set.

The engine is a single cylinder, air-cooled, direct injection, 4-stroke cycle, diesel.
Controls, Indicators & Terminals

The FAULT INDICATOR MODULE is an area where important indicators are displayed. It contains indicator lights that illuminate during fault conditions which assist in troubleshooting the generator set. A list of these indicators is found on the right.

Click on each item name to view its location on the FAULT INDICATOR MODULE as well as its description.
DURING: AFTER 8 HOURS

After 8 hours of continual operation, you will need to shut down the generator set and check the oil level. The generator set is not fully mission capable if the oil level is at or below the minimum oil level mark on the dipstick.

After 8 hours of continual operation you will also need to check the fuel filter/water separator to make sure water and fuel are not mixed. Again, the generator set should be shut down during this procedure. If you find that water and fuel are mixed, you will need to drain water from the fuel filter/water separator by turning a valve on the separator.
## PMCS Procedure Illustration

### PMCS Before:
- Battery Set
- Enclosure Cover
- Intake & Exhaust Ducts
- Control Panel
- Convenience Receptacle
- Diesel Receptacle
- Output Panel
- Muffler
- Fuel Fill Area
- Fuel Tank/Return
- Fuel/Water Separator
- Sump Seal
- Vibration Masts
- Battery and Cables
- Power Inverter
- Engine Oil
- Air Filter

### Table:

<table>
<thead>
<tr>
<th>Item No</th>
<th>Interval</th>
<th>Location</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Before</td>
<td>Oil</td>
<td>Open and review wear. Replace as necessary. Check oil, oil pan and breather. Add oil as required.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oil Pan</td>
<td>Clean. If necessary, drain oil and replace oil filter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rubber</td>
<td>Clean.</td>
</tr>
</tbody>
</table>

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**Note:** This illustration represents the inspection of items.
PMCS Practice

Quick Check:
Match the Component name or description below by clicking the tab that is the model.

Click on the model above to match the part below:
Single cylinder, air cooled, direct injection, 4-stroke cycle, diesel
Operating & Troubleshooting

WHITE SMOKE
When the generator set is running you may see white smoke emitted from the engine. If you see white smoke, try the following procedures:

STEP 1:
First, check the engine oil level to see if it is too high. If it is too high, you will need to refer the trouble to the unit maintenance level so they can drain and service the engine oil.

STEP 2:
If the engine oil level is acceptable, check for water in fuel filter/water separator. If water is present, you will need to drain water from filter separator by turning the valve. (Refer to paragraph 3-8 of the Operator Unit and Direct Support Maintenance Manual for more detail.)

STEP 3:
If the fuel filter/water separator checks out to be fine, you should refer the trouble to unit level maintenance.
**Conclusions**

Interactive virtual maintenance trainers offer numerous benefits:

- Lets training take place even if there is no equipment available
- More effective for task-based learning objectives
- Operationally deployable
- Very suitable to address TQG training challenges
Thank you! Questions?

For more information:

Erik Kaas
604-669-9973 ext 267
ekaas@ngrain.com

Case studies and Whitepapers:
www.ngrain.com

To order 3kW TQG Operator Course Computer-Based Training CD:
www.pm-mep.army.mil/logistics/TrgMat.htm