

MALFUNCTION ABATEMENT PLAN
Toyota Motor Engineering and Manufacturing
North America, Inc.
1555 Woodridge RR#7
Ann Arbor, MI 48105

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MALFUNCTION ABATEMENT PLAN
REVISION HISTORY

<u>Rev.</u>	<u>Description of Changes</u>	<u>Date</u>
01	Initial release	September 11, 2006
02	Updates 5.0 & 6.5	April 27, 2009
03	CCO Review	June 6, 2011
04	Added B.27	October 12, 2011
05	Updates 6.0 & Appendix B	December 10, 2011

Malfunction Abatement Plan
Toyota Motor Engineering and Manufacturing
North America, Inc

1.0 PURPOSE

The purpose of the Malfunction Abatement Plan (MAP) is to comply with special condition number 5.4 of Permit to Install No. 45-03C issued Toyota Engineering and Manufacturing, North America, Inc. (TEMA) and to document compliance with the Michigan Department of Environmental Quality (MDEQ-AQD) Air Pollution Control Rule R 336.1911 which requires:

- (1) Upon request of the commission, a person responsible for the operation of a source of air containment shall prepare a malfunction abatement plan to prevent, detect, and correct malfunctions or equipment failures resulting in emissions exceeding any applicable emission limitation.

- (3) A malfunction abatement plan required by sub rule (1) shall be submitted to the commission and shall be subject to review and approval by the commission

2.0 PROCESS AND CONTROL EQUIPMENT DESCRIPTION

TEMA, State registration number (SRN) N2915, operates a vehicle research and testing facility in Ann Arbor Michigan. Engine and vehicle performance testing is conducted within test cells located in the Evaluation building (located at 1555 Woodridge) and at the Powertrain Building (1588 Woodridge) on the Toyota Technical Center Ann Arbor Campus.

Emissions from the engine test cells are exhausted to a thermal oxidizer manufactured by Catalytic Products, Inc. Model No Quadrant SR-8,000. The Thermal Oxidizer is a recuperative unit that uses a floating tube, shell and tube heat exchanger to preheat the process exhaust gas before being introduced into the combustions chamber. Inside the combustion chamber are a series of baffles which maximize the residence time and destruction of any air containments. The treated gas stream is then routed back into the heat exchanger for energy recovery (heating of inlet untreated gas) and released to the atmosphere through a 50- inch diameter exhaust stack.

The thermal oxidizer has the capacity to treat 8,000 standard cubic feet of process exhaust gas per minute. It has a maximum heat input of 5.2 million British Thermal Units per hour (MMBtu/hr), however, to maintain normal operating temperature of 1,425 F requires a heat input of 3.08 MMBtu/hr. The unit is fired with natural gas.

3.0 Scope

The scope of Malfunction Abatement Plan is limited to the operations associated with the Catalytic Products, Inc. thermal oxidizer (Model No. Quadrant SR-8,000) Used to control emission from the engine test cells (EU-TESTCELLS) permitted under permit No. 45-03C at TEMA in Ann Arbor, Michigan

4.0 AIR POLLUTION CONTROL REQUIREMENTS

The thermal oxidizer is required, by special condition No. 5.5 of Permit No. 45-03C, to be operated in a satisfactory manner at all times during operation of the engine test cells. Satisfactory operation is defined as a minimum chamber temperature of 1,400 °F and minimum retention time of 0.5 seconds (or alternate parameters determined during the performance testing) in order to ensure destruction of carbon monoxide and total hydrocarbon compounds exhausted by the engine test cells.

Upon a malfunction or abnormal condition, which causes the thermal oxidizer to operate outside of the acceptable parameters, the oxidizer may be temporarily bypassed and emissions from the engine test cells vented directly to the atmosphere for up to two (2) hours to correct the problem. If the problem is not corrected within (2) hours the engine test cells combined fuel usage must be reduced and may not exceed 80 gallons per hour. A maximum of 12,000 gallons of fuel may be burned annually while the oxidizer is bypassed as stated in Special Condition No 5.3 of Permit No. 45-03C.

MDEQ-AQD Air Pollution Code Rule 336.1912 stipulates that if a malfunction or abnormal condition or malfunction a written report shall be submitted to the current facility inspector at the following address:

MDEQ-AQD Jackson District
State Office Building, 4th Floor
301 East Louis B. Glick Hwy.
Jackson, Michigan 49201-1556

The written report must include the time, date, duration and reasons for the malfunction or abnormal condition. It must include all the process equipment affected by the malfunction or abnormal condition, and the type and quantity of emissions released while the thermal oxidizer is bypassed. The report must also include the actions taken to correct and prevent a reoccurrence of the malfunction or abnormal condition.

A malfunction notification letter template is presented in Appendix A.

If the malfunction or abnormal condition and corresponding corrective actions are not contained within this malfunction abatement plan then a revised plan, containing the malfunction or abnormal condition and corresponding corrective actions, must be submitted to the MDEQ-AQD Jackson District within 45 days after the malfunction or abnormal condition.

5.0 Malfunction Procedures

In the event of a thermal oxidizer malfunction, operating personnel are advised to notify the following personnel:

Primary Contact – Mr. Henry McAuley, (734) 995-7149 or (734) 604-7210

Secondary Contact – Mr. Mike Burgett (734) 995-7147 or (734) 358-3209

Alternate contact – Mr. Marshal Azar, (734) 995-7195 or (734) 834-2494

SSE – Environmental – Kristen Baumia, (734)995-5317 or (734) 604-7215

If the malfunction inhibits the control device from working properly (i.e. unable to maintain a minimum chamber temperature of 1400 dF and minimum residence time of 0.5 seconds, or alternate parameters determined during the performance test) the thermal oxidizer shall be taken offline (i.e. emissions from the engine test cells shall bypass the oxidizer and exhaust directly to atmosphere), until a time when the oxidizer can achieve satisfactory operating parameters. Any malfunctions will be corrected as soon as possible.

After the problems have been corrected the oxidizer should be brought back online. After the oxidizer has been brought back online it should be monitored to ensure it is working properly and that the problem has been successfully corrected.

Monthly and previous 12-month records of the hours during which time thermal oxidizer was bypassed, the hourly fuel usage during the time that the thermal oxidizer was bypassed and hourly CO emissions during the time the thermal oxidizer was bypassed will be recorded. In the event that a malfunction occurs that causes the thermal oxidizer to be bypassed, the aforementioned records will be forwarded to the MDEQ-AQD within 30 days of the end of the month during which the malfunction occurred.

Current malfunction procedures and corrective actions are presented in Appendix B

6.0 PREVENTATIVE MAINTENANCE

Catalytic Products, Inc. operating manual has detailed preventative maintenance instructions. This plan presents those determined to be critical to proper operation of the thermal oxidizer.

6.1 Weekly Maintenance

The following preventative maintenance should be performed on a weekly (every 160 hours of operation) basis:

- Visually inspect the gas train, inlet duct and RTO exterior for cracks and unusual or excessive vibration.
- Inspect all TEFC 480V motor intakes for buildup of debris or trash, and clean as required.

6.2 Monthly Maintenance

The following preventative maintenance should be performed on a monthly (every 640 hours of operation) basis:

- Check and lubricate all fan bearings and damper bearings if needed.

6.3 SEMI- ANNUAL MAINTENANCE

The following preventative maintenance should be performed on a semi-annual (every 3,800 hours of operation) basis:

- The spark igniter should be checked to ensure that the quartz is not cracked, the igniter is not bent or burned, and the probe is not coated.
- The burner actuator should be checked to ensure proper operation. All valves should be cycled, and all limits and strokes of the actuators checked for correct set up. The actuator connection should be checked to ensure the coupling is secure.
- Leak test natural gas piping connections with a bubble solution.
- The vibration levels of all fans and blowers should be checked and compared to original installation baseline levels.
- The sensing lines and ports transmitters and switches should be cleaned and replaced if needed.

6.4 ANNUAL MAINTENANCE

The following preventative maintenance should be performed on an annual (every 7,600 hours of operation) basis. These items require shutdown of the thermal oxidizer and possible internal entry. All appropriate confined space entry procedures should be observed. Catalytic products, Inc. representatives may be contacted to perform the internal mechanical integrity check.

- The inside of the oxidizer should be visually inspected for any signs of high temperature or fatigue due to stress, especially at the weld seams. Verify insulation condition and fill any gaps with cerawool strips.
- The pressure gauges should be checked.

- Calibrate or replace the thermocouples, UV sensor and sensor site tube if necessary.

A record of all preventative maintenance and inspections will be maintained on the maintenance log sheets in Appendix C.

6.5 SPARE PARTS INVENTORY

A record of critical spare parts in inventory for the oxidizer will be maintained according to the manufacturer's specifications. Upon use of spare part, one will immediately be recorded and upon arrival shall be recorded on the inventory sheet in Appendix D.

A copy of Permit to install No. 45-03C issued TEMA is presented in Appendix E.

APPENDIX A

SAMPLE MALFUNCTION NOTIFICATION LETTER

Date

Current Facility Inspector

MDEQ-AQD Jackson District
State Office Building, 4th Floor
301 East Louis B. Glick Hwy.
Jackson, Michigan 49201-1556

RE: Toyota Engineering and Manufacturing, north America, Inc. 10-day Malfunction Notification report (State registration No. N2915)

Dear Mr. /Mrs. *Name*

Toyota Motor Engineering & Manufacturing, North America, Inc. (TEMA) is required to maintain a Malfunction Abatement Plan (MAP) for operation of a thermal oxidizer that controls emissions of carbon monoxide and hydrocarbons from engine test cells. The MAP requires that if a malfunction condition occurs which causes the thermal oxidizer to deviate from satisfactory operation for a time period greater than two (2) hours the Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) Jackson District within 10 days of the correction or 30 days of the discovery of the malfunction condition. Please consider this letter as the required written report for the malfunction event that occurred at the facility. As required by the MAP, a verbal/email notification was made to (*Give name of the person talked to*) of the MDEQ-AQD Jackson district on (*List date*)

On (*List dated and describe what caused the malfunction or abnormal condition and what was done to correct it*). The malfunction condition lasted for (*duration of malfunction condition*), during which time the thermal oxidizer was bypassed and emissions from the engine test cells were vented directly to the atmosphere. For the previous 12-month time period the oxidizer has operated a total of (*12-month total duration of malfunction conditions*) in bypass mode.

During the time that the thermal oxidizer was bypassed the engine test cells were limited to a maximum gallons of gasoline per hour as required by the MAP and special Condition 5.3 of New Source review Permit No. 45-03C. Hourly fuel use records and CO emission calculations are attached (*Attach hourly fuel use records and CO emission calculations for the entire duration of malfunction*).

The actions taken to correct the malfunction were contained within Appendix B of the MAP for the facility. A revised plan will be submitted to the MDEQ-AQD Jackson District within 45 days of the malfunction event.

If you have any questions regarding this 10-day Malfunction Notification Report, please contact me at (*List Phone Number*)

Sincerely,
(Name of Responsible Official)
(Title)

APPENDIX B

Malfunction Procedures

MALFUNCTION PROCEDURES

The following conditions indicate a malfunction of the system; all malfunctions will cause an alarm to be displayed on the programmable logic controller for the thermal oxidizer. The malfunction alarm will also shut down the thermal oxidizer and cause a local audible/visual alarm in the test cell operator area. In addition the alarm signal will also be received by the Security Office which is staffed twenty four (24) hours a day. The operating technicians and Security have procedures in place to contact Environmental and Facilities and notify them immediately of the alarm condition.

- Low Gas Pressure Switch Fault
 - High gas Pressure Switch Fault
 - Booster Fan Pressure Switch Fault
 - High Duct Pressure Switch Fault
 - Pressure Blower Pressure Switch Fault
 - Pressure Blower Starter Fault
 - Gas Control Valve Failed to Close
 - Main Gas Shutoff Valve Failed to Open/Close
 - Block Valve Failed to Open/Close
 - Flame Safety Fault
 - Loss of Flame
 - Loss of Temperature
 - Fresh Air Damper Failed to Open/Close
 - Isolation Damper Failed to Open/Close
 - Booster Fan/Pressure Blower Disconnect Fault
 - Booster Fan VFD Fault/VFD Run Fault
 - Oxidizer Running-Bypass Inactive/Bypass Running Oxidizer Inactive
 - High Solvent Warning
 - Watch Dog Timer Relay Failure
-

B.1 Low Gas Pressure Switch Fault

In the event that the pressures switch on the gas train has opened, indicating a low gas pressure condition:

1. Inspect the gas supply valve. If it has been shut off, determine why it was shut off, determine if conditions are safe for the valve to be opened, and open the valve.
2. Inspect the hand valve and make sure it is open.
3. Inspect the main gas regulator. If it is set too low, adjust the spring to raise main gas pressure. Check main gas pressure to make sure there are no variations at the main inlet.
4. Inspect wire terminations and the switch to determine if they are faulty, replace if needed.

B.2 High Gas Pressure Switch Fault

In the event that the pressures switch on the gas train has opened, indicating a high gas pressure condition:

1. Check the gas supply pressure. If it is too high, lower the pressure
2. Inspect the main gas regulator. If it has failed, replace the regulator.
3. Inspect the main gas regulator. If it is set too high, adjust the spring to lower the main gas pressure to make sure there are no variations at the main inlet.
4. Inspect wire terminations and the switch to determine if they are faulty, replace if needed.

B.3 Booster Fan Pressure Switch Fault

In the event that the equipment is running and the pressure switch on the booster fan has opened, indicating a fault condition:

1. Inspect the booster fan belts and replace if they are faulty.
2. Inspect the sensing lines to determine if they are clogged.
3. Inspect wire terminations and the switch to determine if they are faulty, replace if needed.

B.4 High Duct Pressure Switch Fault

In the event that there is a high negative pressure detected in the main duct:

1. Inspect the sensing lines to determine if they are clogged.
2. Check the dampers and the booster fan for proper operation.
3. Inspect the wire terminations and the switch to determine if they are faulty, replace if needed.

B.5 Pressure Blower Pressure Switch Fault

In the event that the equipment is running and the pressure switch on the pressure blower has opened, indicating a fault condition:

1. Inspect the motor for proper operation.
2. Inspect the sensing lines to determine if they are clogged.
3. Inspect wire terminations and the switch to determine if they are faulty, replace if needed.

B.6. Pressure Blower Motor Starter Fault

In the event that the pressure blower motor starter does not start in the expected amount of time:

1. Inspect the motor starter for proper operation.
2. Inspect wire terminations and the auxiliary switch to determine if they are faulty, replace if needed.

B.7 Gas Control Valve Failed to Close

In the event that the gas control valve fails to close:

1. Inspect the valve linkage to determine if it is out of adjustment, adjust if necessary.
2. Inspect the control valve actuator to determine if it is faulty, replace if needed
3. Inspect wire terminations and limit switch to determine if they are faulty, replace if needed.

B.8 Main Gas shutoff Valve Failed to Open/Close

In the event that the main gas block valve fails to open or close:

1. Inspect the limit switch to determine if it is out of adjustment or faulty, adjust or replace if necessary.
2. Inspect the main gas block valve actuator to determine if it is faulty, replace if needed.
3. Inspect wire terminations to determine if they are faulty, replace if needed.

B.9 Block Valve Failed to Open/Close

In the event that the main gas block valve fails to open or close:

1. Inspect the limit switch to determine if it is out of adjustment or faulty, adjust or replace if necessary.
2. Inspect the main gas block valve actuator to determine if it is faulty, replace if needed.
3. Inspect wire terminations to determine if they are faulty, replace if needed.

B.10 Flame Safety Fault

In the event that the burner flame does not light after three (3) attempts:

1. Inspect the spark igniter and ignition transformer to determine if they are operating properly, replace if needed
2. Inspect ignition transformer and flame safety wire terminations to determine if they are faulty, replace if needed.

B.11 Loss of flame

In the event that after the flame is established the UV scanner detects a low or lost signal, indicating a loss of flame:

1. Inspect the burner low fire position and determine if it is set too low, adjust as necessary.
2. Remove and inspect the UV scanner lens to determine if it is being obstructed, clean or replace if necessary.
3. Inspect flame safety and UV scanner wire terminations and determine if they are faulty, replace if necessary.
4. Inspect the UV scanner and determine if it is faulty, replace if needed.

B.12 Loss of temperature

In the event that the oxidizer temperature drops below the minimum operating limit:

1. Check gas train components and natural gas supply to determine if the flow is too low.
2. Check process airflow to determine if the flow is too high.

B.13 Fresh Air Damper Failed to Open/Close

In the event that the fresh air damper fails to open or close

1. Inspect the limit switch to determine if it is out of adjustment or faulty, adjust or replace as necessary.
2. Inspect the damper to determine if it has free travel.
3. Inspect the fresh air damper actuator to determine if is faulty, replace if needed.
4. Inspect wire terminations to determine if they are faulty, replace if needed

B.14 Isolation Damper Failed to Open/Close

In the event that the isolation damper fails to open or close:

1. Inspect the limit switch to determine if it is out of adjustment or faulty, adjust or replace if necessary.
2. Inspect the damper to determine if it has free travel
3. Inspect the isolation damper actuator to determine if it is faulty, replace if needed.
4. Inspect wire terminations to determine if they are faulty, replace if needed.

B.15 Booster Fan/Pressure Blower Disconnect Fault

In the event that the booster fan or pressure blower disconnect auxiliary switch is not made:

1. Make sure the disconnect is turned on.
2. Inspect the auxiliary limit switch to make sure it is making and is not faulty, adjust or replace if necessary.
3. Inspect wire terminations to determine if they are faulty, replace if needed.

B.16 Booster Fan VFD Fault/VFD Run Fault

In the event that the booster fan VFD has faulted or not given a run output in the expected amount of time:

1. Inspect the booster fan VFD to determine if it is in a fault condition, troubleshoot using VFD manual
2. Inspect the VFD to determine if the run contact was made, troubleshooting using VFD manual.
3. Inspect wire terminations to determine if they are faulty, replace if needed.

B.17 Oxidizer High Temperature

In the event that the oxidizer chamber temperature has risen above established high temperature limit:

1. Check the process air stream to determine if solvent concentrations are too high.
2. Inspect the gas control valve to determine if it is operating correctly.
3. Inspect thermocouple wire terminations and thermocouple to determine if they are faulty, replace if needed.
4. Inspect the high temperature limit switch to determine if it is faulty, replace if needed.

B.18 Pressure Transmitter Alarm High/Low

In the event that a high differential pressure is detected in the system:

1. Inspect the high and low side sensing lines to determine if they are clogged
2. Inspect the ductwork and dampers to determine if there is an obstruction.
3. Inspect the wire terminations and pressure transmitter to determine if they are faulty, replace if needed

B.19 Air Control Valve Failed to Close

In the event that the air control valve has not closed:

1. Inspect the air control valve linkage to determine if it is out of adjustment, adjust or replace if necessary.
2. Inspect the air control valve actuator to determine if it is faulty, replace if needed.
3. Inspect wire terminations and the limit switch to determine if they are faulty, replace if needed.

B.20 Combustion Air Blower Disconnect Fault

In the event that the combustion air blower motor disconnect auxiliary switch is not made:

1. Make sure the disconnect is turned on.
2. Inspect the auxiliary limit switch to make sure it is making connection and not faulty, adjust or replace as necessary.
3. Inspect wire terminations to determine if they are faulty, replace if needed.

B.21 Combustion Air Blower Motor Start Fault

In the event that the combustion air blower motor starter does not start in the expected amount of time:

1. Inspect the motor starter for proper operation, replace if needed
2. Inspect wire terminations and the auxiliary switch to determine if they are faulty, replace if needed.

B.22 Combustion Air Blower Pressure Switch Fault

In the event that the pressure switch on the combustion air blower has gone open:

1. Check the motor and determine if it is operating properly, replace if needed
2. Inspect high and low side sensing lines for blockage.
3. Inspect wire terminations and switch to determine if they are faulty, replace if needed.

B.23 High Duct Temperature

In the event that the temperature measured in the chamber by thermocouple TE192 has risen above the established limit:

1. Check the process air stream to determine if the solvent concentration is too high.
2. Inspect the gas control valve to determine if it is working properly.
3. Inspect thermocouple wire terminations and thermocouple to determine if they are faulty, replace if needed.

B.24 Oxidizer-Running Bypass-Inactive / Bypass - Running Oxidizer- inactive

In the event that the oxidizer is running and not allowing the bypass blower to start or the bypass blower is running and not allowing the oxidizer to start:

1. Deselect the request to run option for either the oxidizer or bypass blower on the PLC and then start the bypass blower or oxidizer, respectively.

B.25 High CO/Hydrocarbon Warning

In the event that the solvent loading is too high:

2. Check process air stream to determine if the CO/hydrocarbon concentration is too high.
3. Inspect the contact to determine if it is faulty, replace if needed.
4. Inspect the LEL monitor to determine if it is faulty, replace if needed.

B.26 Watch Dog Timer Relay Failure

In the event that watch dog Timer relay fails:

1. Check the program status on the PLC board.
2. Call Catalytic Products to have them replace the watch Dog timer relay.
3. Once the relay is replaced, reprogram the PLC board with the same software revision and verify unit is working properly.

B.27 Temperature Recorder Failure

In the event the temperature recorder does not write to the USB-Key (red light is not on):

1. Check the program status on the PLC board.
2. Replace the USB-Key & immediately check to see if it records the data on the spare USB-Key.
3. Call Solution Controls for recorder service immediately.

4. Verify the back up data recorder is still recording the data and saving to the appropriate folder on the network
5. In the event that the back up data recorder is not recording data, verify the main temperature recorder is still recording and print out current temperature logs from the USB-Key. Call for service immediately.
6. In the event the network drive fails and back up data is lost, contact the IS department and request them to restore the data back up from the previous day to the drive and print out the temperature records.

*Toyota Engineering and Manufacturing, North America, Inc.
Malfunction Abatement Plan*

APPENDIX C

PREVENTATIVE MAINTENANCE WORK INSTRUCTIONS
AND SCHEDULES

**Oxidizer Preventative Maintenance
Weekly and Monthly Maintenance Work Instructions**

The following preventative maintenance instructions are to be performed at weekly and monthly intervals.

The person completing the preventative maintenance shall complete the “Weekly and Monthly” report according to the following instructions and file the completed report in this Appendix.

1. Date Performed: Date of inspection and maintenance.
2. Checked by Int.: Initials of person completing the maintenance.
3. Comment: Optional field to record any comments or observations.

**WEEKLY AND MONTHLY PREVENTATIVE
MAINTENANCE SCHEDULE**

DATE: _____

WEEKLY MAINTENANCE	DATE PERFORMED	CHECKED BY-INT.	COMMENTS
Visually Inspect Gas Train for Leaks and Excessive Vibration			
Inspect and Clean TEFC 480V Motor Intakes			
Inspect Inlet Ductwork for Cracks, Leaks and Excessive Vibration			
Visually Inspect Outside of Oxidizer for Discoloration and Excessive Vibration			
MONTHLY MAINTENANCE	DATE PERFORMED	CHECKED BY-INT.	COMMENTS
Check Lubrication of all Fan Bearings and Lubricate if Needed			

**Oxidizer Preventative Maintenance
Semiannual and Annual Maintenance Work Instructions**

The following preventative maintenance instructions are to be performed semiannually and annually.

The person completing the preventative maintenance shall complete the "Semiannual and Annual Preventative Maintenance Schedule" report according to the following instructions and file the completed report in this Appendix.

1. Date Performed: Date of inspection or maintenance.
2. Checked by Int.: Initials of person completing the inspection or maintenance.
3. Comment: Optional field to record any comments or observations.

**SEMIANNUAL AND ANNUAL PREVENTATIVE
MAINTENANCE SCHEDULE**

DATE: _____

SEMIANNUAL MAINTENANCE	DATE PERFORMED	CHECKED BY-INT.	COMMENTS
Clean All Sensing Lines and Ports to Transmitters and Switches, Replace if Needed			
Inspect Spark Ignitor, Ensure it is not Bent or Burned, Quartz is not Cracked and Probe is not Coated			
Check Burner Actuator to Ensure Proper Operation			
Leak Test Natural Gas Piping with Bubble Solution			
Check Vibration Levels of all Fans and Blowers			
ANNUAL MAINTENANCE	DATE PERFORMED	CHECKED BY-INT.	COMMENTS
Visually Inspect Inside of Oxidizer for Signs of High Temperature or Fatigue due to Stress			
Check Pressure Gages			
Replace Thermocouples, UV Sensor and Sensor Site Tube if Necessary			
Replace any Insulation Voids or Openings with Cerawool Strips			

*Toyota Engineering and Manufacturing, North America, Inc.
Malfunction Abatement Plan*

APPENDIX D

WORK INSTRUCTIONS AND
AIR QUALITY PARTS INVENTORY SHEET

Air Quality Parts Inventory Work Instructions

1. Upon beginning new sheet enter in current date in space labeled start date.
2. Enter number of parts in inventory after necessary replacements parts are used in repairs and the date used. If needed reorder parts to match with the predetermined necessary amount set by Catalytic Products, Inc. in the column labeled "# Kept in inventory"
3. Upon arrival of spare parts update inventory.
4. Any necessary comments may be made in the appropriate column.

AIR QUALITY PARTS INVENTORY SHEET

Date Started: _____

Date Ending: _____

Required Oxidizer Spare Parts	# Kept in Inventory	# Present Inventory	Date Used	Comments
PID No. 176, Maxon Spark Ignitor	1	1		
PID No. 177, Honeywell UV Scanner	1	1		
PID No. 190, Pyromation Thermocouple	1	1		
PID No. 193, Pyromation Thermocouple	1	1		
PID No. 130, Ametek 0-15 psi Pressure Indicator	1	1		
PID No. 252, Karl Dungs Booster Fan Pressure Switch	1	1		
PID No. 143, Honeywell Gas Control Valve Actuator	1	1		
PID No. 104, Ametek 0-30" WC Pressure Indicator	1	1		
PID No. 216, Karl Dungs Combustion Air Blower PS	1	1		
PID No. 226, Karl Dungs Pressure Blower Pressure Switch	1	1		
PID# 23 processor	1	1		
PID # 12 view panel	1	1		
PID# 26 input PLC card	1	1		
PID # watch dog timer	1	1		
PID Software	1	1		
Ultra compact Flash 15MB/s 2GB	1	1		

IMPORTANT: ALL REQUIRED PARTS USED MUST BE REORDERED IMMEDIATELY

APPENDIX E

PERMIT TO INSTALL 45-03B

**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION**

May 20, 2008

PERMIT TO INSTALL
No. 45-03C

ISSUED TO
Toyota Motor Engineering and Manufacturing
North America, Inc.

LOCATED AT
1555 Woodridge, RR #7
Ann Arbor, Michigan 48105

IN THE COUNTY OF
Washtenaw

STATE REGISTRATION NUMBER
N2915

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environmental Quality. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: 4/18/2008	
DATE PERMIT TO INSTALL APPROVED: 5/20/2008	SIGNATURE: 
DATE PERMIT VOIDED:	SIGNATURE:
DATE PERMIT REVOKED:	SIGNATURE:

PERMIT TO INSTALL

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GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **(R 336.1201(1))**
2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environmental Quality, P.O. Box 30260, Lansing, Michigan 48909, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **(R 336.1201(4))**
3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to R 336.1210, operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **(R 336.1201(6)(b))**
4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **(R 336.1201(8), Section 5510 of Act 451, PA 1994)**
5. The AQD District Supervisor shall be notified, in writing, of a change in ownership or operational control of the stationary source or emission unit(s) authorized by this Permit to Install pursuant to R 336.1219. The notification shall include all of the information required by R 336.1219(1)(a) and (b). In addition, a new owner or operator must submit a written statement pursuant to R 336.1219(1)(c), agreeing to and accepting the terms and conditions of this Permit to Install, and shall notify the AQD District Supervisor of any change in the contact person for this Permit to Install. **(R 336.1219)**
6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **(R 336.1901)**
7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **(R 336.1912)**

SPECIAL CONDITIONS

Emission Unit Identification

Emission Unit ID	Emission Unit Description	Stack Identification
EU-ANECHOIC	Anechoic chamber	SV-EF-101
EU-ENVIRON	Environmental chamber	SV-EF-115
EU-DYNOS	Chassis dynamometer 1, 2, 3 & 4 in powertrain building	SV-EF-16
EU-CHDY5-6	Chassis dynamometers 5 & 6	SV-CHDY5, SV-CHDY6
EU-TESTCELLS	Engine test cell 1, 2, 3, & 4 in powertrain building	SV-EF-09BP, SV-EF-09TO
EU-TESTCELL-EG3	An uncontrolled engine test cell in powertrain building	SV-TESTCELL-EG3
EU-TANK1	12,000 gallon underground gasoline storage tank	N/A
EU-TANK2	5,000 gallon underground gasoline storage tank	N/A
EU-TANK3	5,000 gallon underground gasoline storage tank	N/A
EU-TANK4	5,000 gallon underground gasoline storage tank	N/A
EU-TANK5	15,000 gallon above ground fuel storage tank	N/A
Changes to the equipment described in this table are subject to the requirements of R 336.1201, except as allowed by R 336.1278 through R 336.1290.		

Flexible Group Identification

Flexible Group ID	Emission Units Included in Flexible Group	Stack Identification
FG-TANKS	EU-TANK1, EU-TANK2, EU-TANK3, EU-TANK4, EU-TANK5	N/A

The following conditions apply to: EU-ENVIRON

Material Usage Limits

2.1 The fuel usage for EU-ENVIRON shall not exceed 2,245 gallons per 12-month rolling period as determined at the end of each calendar month. (R 336.1205(1)(a) & (3), R 336.1225)

Equipment

2.2 The permittee shall equip and maintain all vehicles tested in EU-ENVIRON with a catalytic converter. (R 336.1205(1)(a) & (3), R 336.1225, R 336.1910)

Recordkeeping/Reporting/Notification

2.3 The permittee shall keep, in a satisfactory manner, monthly fuel use records for EU-ENVIRON. All records shall be kept on file for a period of at least five years and made available to the Department upon request. (R 336.1205(1)(a) & (3), R 336.1225)

Stack/Vent Restrictions

	Stack & Vent ID	Maximum Diameter (inches)	Minimum Height Above Ground Level (feet)	Applicable Requirement(s)
2.4	SV-EF-115	6	40	R 336.1225
The exhaust gases shall be discharged unobstructed vertically upwards to the ambient air.				

The following conditions apply to: EU-CHDY5-6

Material Usage Limits

- 4.1 The fuel usage for EU-CHDY5-6 shall not exceed 15 gallons per hour, nor 1,500 gallons per 12-month rolling time period as determined at the end of each calendar month. (R 336.1205(1)(a) & (3), R 336.1225)

Equipment

- 4.2 The permittee shall equip and maintain all vehicles tested in EU-CHDY5-6 with a catalytic converter. (R 336.1205(1)(a) & (3), R 336.1225, R 336.1910)

Recordkeeping/Reporting/Notification

- 4.3 The permittee shall keep, in a satisfactory manner, monthly fuel use records for EU-CHDY5-6. All records shall be kept on file for a period of at least five years and made available to the Department upon request. (R 336.1205(1)(a) & (3), R 336.1225)

Stack/Vent Restrictions

	Stack & Vent ID	Maximum Diameter (inches)	Minimum Height Above Ground Level (feet)	Applicable Requirement(s)
4.4a	SV-CHDY5	20	44	R 336.1225
4.4b	SV-CHDY6	20	44	R 336.1225
The exhaust gases shall be discharged unobstructed vertically upwards to the ambient air.				

Monitoring

5.6 The permittee shall install, calibrate, maintain and operate in a satisfactory manner a device to monitor and record the temperature in the thermal oxidizer near the combustion chamber outlet on a continuous basis. (R 336.1205, R 336.1225, R 336.1910, R 336.2804, 40 CFR 52.21 (d))

Recordkeeping/Reporting/Notification

5.7 The permittee shall complete all required calculations in a format acceptable to the AQD District Supervisor and make them available by the 30th day of the calendar month, for the previous calendar month, unless otherwise specified in any recordkeeping, reporting or notification special condition. (R 336.1205, R 336.1225, R 336.2803, R 336.2804, 40 CFR 52.21 (d))

5.8 The permittee shall keep, in a satisfactory manner, monthly and previous 12-month CO emission calculation records for EU-TESTCELLS, as required by SC 5.1b. The permittee shall keep all records on file for a period of at least five years and make them available to the Department upon request. (R 336.1205)

5.9 The permittee shall keep, in a satisfactory manner, monthly fuel use records for EU-TESTCELLS, as required by SC 5.2. The permittee shall keep all records on file for a period of at least five years and make them available to the Department upon request. (R 336.1205, R 336.1225, R 336.2804, 40 CFR 52.21 (d))

5.10 The permittee shall keep, in a satisfactory manner, monthly and previous 12-month records of the hours during which EU-TESTCELLS bypasses the thermal oxidizer as allowed by SC 5.3, the hourly fuel usage during thermal oxidizer bypass as required by SC 5.3, and hourly CO emission calculations during thermal oxidizer bypass as required by SC 5.1a. The permittee shall submit all records to the AQD District Supervisor in an acceptable format within 30 days following the end of the month in which the records were collected. (R 336.1205, R 336.1225, R 336.2804, 40 CFR 52.21 (d))

5.11 The permittee shall keep, in a satisfactory manner, records of the temperature in the thermal oxidizer near the combustion chamber outlet on a continuous basis, as required by SC 5.6. The permittee shall keep all records on file for a period of at least five years and make them available to the Department upon request. (R 336.1205, R 336.1225, R 336.1910, R 336.2804, 40 CFR 52.21 (d))

Stack/Vent Restrictions

	Stack & Vent ID	Maximum Diameter (inches)	Minimum Height Above Ground Level (feet)	Applicable Requirement(s)
5.12a	SV-EF-09BP	24	44	R 336.1225, R 336.2804, 40 CFR 52.21 (d)
5.12b	SV-EF-09TO	50	44	R 336.1225, R 336.2804, 40 CFR 52.21 (d)
The exhaust gases shall be discharged unobstructed vertically upwards to the ambient air.				

- 6.7 The permittee shall keep, in a satisfactory manner, monthly fuel use records for EU-TESTCELL-EG3, as required by SC 6.2. The permittee shall keep all records on file for a period of at least five years and make them available to the Department upon request. (R 336.1205, R 336.1225, R 336.2804, 40 CFR 52.21 (d))

Stack/Vent Restrictions

Stack & Vent ID	Maximum Diameter (inches)	Minimum Height Above Ground Level (feet)	Applicable Requirement(s)
6.8 SV-TESTCELL-EG3	24	49	R 336.1225, R 336.2804, 40 CFR 52.21 (d)
The exhaust gases shall be discharged unobstructed vertically upwards to the ambient air.			



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - AIR QUALITY DIVISION

PERMIT TO INSTALL APPLICATION

For authority to install, construct, reconstruct, relocate, or modify process, fuel-burning or refuse burning equipment and/or control equipment. Permits to install are required by administrative rules pursuant to Section 5505 of 1994 PA 451, as amended.

FOR DEQ USE
APPLICATION NUMBER
45-03B

Please type or print clearly. The "Application Instructions" and "Information Required for an Administratively Complete Permit to Install Application" are available on the AQD Permit Web Page at http://www.deq.state.mi.us/aps, or contact the Air Quality Division at 517-373-7023.

RECEIVED
JAN 24 2006
AIR QUALITY DIV.

1 FACILITY CODES: State Registration Number (SRN) and North American Industry Classification System (NAICS)		
SRN	N 2 9 1 5	NAICS
2. APPLICANT NAME: (Business License Name of Corporation, Partnership, Individual Owner, Government Agency) Toyota Technical Center, U.S.A., Inc.		
3. APPLICANT ADDRESS: (Number and Street) 1555 Woodridge Road, RR#7		MAIL CODE:
CITY: (City, Village or Township) Ann Arbor	STATE: MI	ZIP CODE: 48105
4 EQUIPMENT OR PROCESS LOCATION: (Number and Street - If different than Item 3) 1555 and 1588 Woodridge Road		
CITY: (City, Village or Township) Ann Arbor	ZIP CODE: 48105	COUNTY: Washtenaw
5. GENERAL NATURE OF BUSINESS: Vehicle, chassis, engine, and transmission dynamometer test cells		
6 EQUIPMENT OR PROCESS DESCRIPTION: (A Description MUST Be Provided Here. Include Emission Unit IDs. Attach additional sheets if necessary.) EU-ANECHOIC - Anechoic chamber, evaluation building EU-ENVIRON - Environmental chamber, evaluation building FG-DYNOS - 4 chassis dynamometer test cells, powertrain building FG-TESTCELLS - 4 engine test cells, powertrain building		
7. REASON FOR APPLICATION: (Check all that apply.) <input checked="" type="checkbox"/> INSTALLATION / CONSTRUCTION OF NEW EQUIPMENT OR PROCESS <input checked="" type="checkbox"/> RECONSTRUCTION / MODIFICATION / RELOCATION OF EXISTING EQUIPMENT OR PROCESS - DATE INSTALLED: <input type="checkbox"/> OTHER - DESCRIBE		
8. IF THE EQUIPMENT OR PROCESS THAT WILL BE COVERED BY THIS PERMIT TO INSTALL (PTI) IS CURRENTLY COVERED BY ANY ACTIVE PERMITS, LIST THE PTI NUMBER(S): 45-03A		
9. DOES THIS FACILITY HAVE AN EXISTING RENEWABLE OPERATING PERMIT (ROP)? <input checked="" type="checkbox"/> NOT APPLICABLE <input type="checkbox"/> PENDING APPLICATION <input type="checkbox"/> YES PENDING APPLICATION OR ROP NUMBER:		
10. AUTHORIZED EMPLOYEE: John Sidelinker	TITLE: Mgr. of Security, Safety & Environmental Activities	PHONE NUMBER: (Include Area Code) (734) 995-5285
SIGNATURE: <i>John Sidelinker</i>	DATE: 1/16/06	E-MAIL ADDRESS: jsidelin@ttc-usa.com
11. CONTACT: (If different than Authorized Employee. The person to contact with questions regarding this application) Robert Harvey, Engineering Services Manager		PHONE NUMBER: (Include Area Code) (517) 324-1880
CONTACT AFFILIATION: Derenzo and Associates, Inc.		E-MAIL ADDRESS: rharvey@derenzo.com
12. IS THE CONTACT PERSON AUTHORIZED TO NEGOTIATE THE TERMS AND CONDITIONS OF THE PERMIT TO INSTALL? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
FOR DEQ USE ONLY - DO NOT WRITE BELOW		
DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: 2/1/06		
DATE PERMIT TO INSTALL APPROVED: 4/10/06	SIGNATURE: <i>Sharon Fudler</i>	
DATE APPLICATION VOIDED:	SIGNATURE: <i>William A. Pederson</i>	
DATE APPLICATION DENIED: 5-20-08	SIGNATURE:	

A PERMIT CERTIFICATE WILL BE ISSUED UPON APPROVAL OF A PERMIT TO INSTALL