

**draft** EQUIPMENT CERTIFIED & STATUS OF NOTIFICATIONS OF INTENT TO CERTIFY URBAN BUS EQUIPMENT

March 18, 1999

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Public Air Docket A-93-42

**Note:** This document has been compiled and posted on DieselNet as an unofficial summary of the urban bus equipment certification status. For official information contact William Rutledge (202-564-9297) or Anthony Erb (202-564-9259) of the EPA.

	<b>Certifier</b>	<b>Docket Category</b>	<b>Equipment Description</b>	<b>NIC Received</b>	<b>FR Notice: Start 45-day</b>	<b>End 45-day</b>	<b>Certification Date<sup>1</sup></b>
1.	Engelhard 1	IV	Exhaust catalyst (CMX) for 2 stroke/cycle (25 %)	09- -94	59 FR 47581, 09-16-94	10-31-94	60 FR 28402, 05-31-95
2.	Engelhard 2	V	Exh cat (CMX) and ceramitized engine parts (~ %)	11- -94	60 FR 12185, 03-06-95	04-20-95	60 FR 47170, 09-11-95
3.	Detroit Diesel Corp (DDC 1)	VII	Engine upgrade kit for DDC 6V92TA MUI's (25 %)	02-28-95 04-19-95	60 FR 29590, 06-05-95	07-20-95	60 FR 51472, 10-02-95
		(VII)	Life Cycle Cost Information	"	61 FR 8275, 03-04-96	04-18-96	EPA Ltr: 06-24-96 61 FR 37734, 07-19-96
4.	Cummins	VIII	Engine upgrade for Cummins L10 four-stroke/cycle (25 %)	03- -95	60 FR 32316, 06-21-95	08-07-95	60 FR 64046, 12-13-95
5.	Twin Rivers Technologies	X	Biodiesel, exh cat (CMX) & timing retard: 2 stroke/cycle engines (25 %)	06-29-95 08-21-95	60 FR 64051, 12-13-95	01-29-96	EPA Ltr: 09-20-96. 61 FR 54790, 10-22-96
6.	Johnson Matthey 1	XI	Exhaust catalyst (CEM I) for 2 stroke/cycle (25 %)	09-11-95	60 FR 64048, 12-13-95	01-29-96	EPA Ltr: 03-28-96. 61 FR 16773, 04-17-96
7.	DDC 2	XII	Engine upgrade kit for DDC 6V92TA DDECII's (25 %)	01-19-96	61 FR 16739, 04-17-96	06-03-96	61 FR 37738, 07-19-96
8.	Engelhard 3	XIII	ETX 2002 kit: Exh cat, ceramitized parts, & engine upgrade parts for DDC 6V92TA MUI (0.10)	02-01-96	61 FR 20249, 05-06-96	06-20-96 07-19-96	EPA Ltr: 02-28-97 62 FR 12166, 03-14-97
9.	Engine Control Systems 1	XIV	Exhaust catalyst for 2 stroke/cycle (25 %)	01-16-96	61 FR 41408, 08-08-96	09-23-96	EPA Ltr: 12-02-96 62 FR 746, 01-06-97

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10.	Johnson Matthey 2	XV	Exhaust catalyst (CEM II) & engine mods for DDC 6V92TA MUI (0.10)	10-03-96, 12-01-96	62 FR 4528, 01-30-97	03-17-97	EPA Ltr: 09-08-97 62 FR 60079, 11-06-97
11.	ECS 2	XVI	Exh catalyst for 4 stroke/cycle (18%) & 8V71N	11-??-96	62 FR 32602; 06-16-97	07-31-97	63 FR 4445; 01-29-98
12.	Engelhard 4	XVII	Exh cat (CMX) for 1992 - 1993 Cummins L10 EC (25 %)	10-31-96	62 FR 32599; 06-16-97	07-31-97	EPA Ltr.: 02-12-98 63 FR 13660; 03-20-98
		(XVII)	Exh catalyst (CMX) for all other 4 s/c engines (25 %)	04-20-98	63 FR 65780: 11-30-98	01-14-99	Under Review
		(XVII)	Life cycle cost information	>12-09-99	Under Review	<--	<--
13.	NOPEC	XVIII	Biodiesel and exhaust catalyst for 2 stroke/cycle (25 %)	03-06-97	62 FR 62052; 11-20-97	01-05-98	Withdrawn
14.	Nelson Industries	XIX	Exhaust catalyst for 2 stroke/cycle (25 %)	03-17-97	62 FR 37228; 07-11-97	08-25-97	EPA Ltr. 10-14-97 62 FR 63159; 11-26-97
15.	DDC 3	XX	TurboPac, ECS exh cat and engine upgrade for DDC 6V92TA MUI (0.10)	07-18-97	62 FR 60077; 11-06-97	12-22-97	EPA Ltr: 04-06-98 63 FR 26798; 05-14-98
16.	Johnson Matthey 3	XXI	Exhaust catalyst (CEM II) and engine mods for DDC 6V92TA DDEC (0.10)	10-14-97, 03-06-98	63 FR 26795; 05-14-98	06-29-98	EPA Ltr: 10-21-98 63 FR 66798; 12-03-98
		(XXI)	Life Cycle Cost Information	01-26-99	64 FR 11864; 03-10-99	04-26-99	<--
17.	Engelhard 5	XXII	ETX 2002 kit: Exhaust catalyst, ceramitized parts and engine upgrade parts for DDC 6V92TA DDEC2 (0.10)	10-21-97	63 FR 17411; 04-09-98	05-26-98	EPA Ltr: 07-01-98 63 FR 50225; 09-21-98
18.	Turbodyne Systems, Inc.	XXIII	TurboPac & ECS exh catalyst 6V92TA MUI (0.10)	11-14-97	Under Review	<-	<--
19.	DDC 4	XXIV	Exh cat, engine upgrade etc, DDECIII, for 6V92TA (0.10)	12-24-97	63 FR 13662; 03-20-98	05-04-98	EPA Ltr: 10-02-98

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20.	Engelhard 6	XXV	ETX Plus technology for DDEC II engines (0.10)	12-01-98	Under Review	<--	<--
21.	Johnson Matthey 4		CEM IV Cat Muffler for 4 s/c engines (25 %)	12-22-98 ?	Under Review	<--	<--

<sup>1</sup> Many Federal Register notices are available on the Office of Mobile Sources website (<http://www.epa.gov/omswww/>) or the Government Printing Office website ([http://www.access.gpo.gov/su\\_docs/](http://www.access.gpo.gov/su_docs/)).

1. Exhaust catalytic muffler (CMX™) certified by Engelhard Corporation for all two-stroke/cycle engines.

The CMX™ is a catalytic converter that takes the place of the original noise muffler installed in the engine exhaust system. This kit is certified to meet the standard of reducing PM by at least 25 percent (see 60 FR 28402, May 31, 1995, for the PM certification levels assigned to different engine models). Note that only one test engine was used for certification testing. We do not know the baseline emission levels for other engine models.

2. CMX™ plus ceramic in-cylinder coating (GPX-4™) certified by Engelhard Corporation for 1979 - 1989 DDC 6V92TA MUI engines.

The major components are a catalytic converter (the CMX™ described above), and a rebuild kit which incorporates a ceramic in-cylinder coating. This kit is certified for use only in compliance option 2, and is not certified to meet the standard of reducing PM by at least 25 percent (see 60 FR 47170, September 11, 1995). Insufficient data was provided to determine that PM emissions were reduced by at least 25 percent, compared to a standard rebuild. The above data is used to establish a certification level of 0.25 g/bhp-hr for use by operators using compliance program 2 and having 1979 - 1989 DDC 6V92TA MUI engines.

- 3A. Upgrade Kit Certified for Detroit Diesel Corporation 1979 - 1987 6V92TA MUI Engines

This kit "upgrades" 1979 through 1987 model year 6V92TA urban bus engines having mechanical unit injection (MUI), to virtually a 1989 model year configuration. The kit includes gaskets, cylinder kits, fuel injectors, camshafts, blower assembly, turbocharger, and cylinder head assembly.

This kit is certified to meet the standard of reducing PM by at least 25 percent (see 60 FR 51472, October 2, 1995).

- 3B. Upgrade Kit certified for Detroit Diesel 1988 & 1989 6V92TA MUI Engines

Same as kit described in (A) above, except with different fuel injection timing. Note that the baseline test is different than in (A) above. This kit is certified to meet the standard of reducing PM by at least 25 percent (see 60 FR 51472, October 2, 1995).

4. Cummins Engine Company's upgrade kit certified for certain of its model LTA10-B engines

This kit is applicable to Cummins LTA10-B model engines originally manufactured between November 1985 and December 1992. The upgrade kit includes a camshaft, cylinder kits, fuel injectors, cylinder head, turbocharger, and fuel pump. This kit is certified to meet the standard of reducing PM by at least 25 percent (see 60 FR 64046, December 13, 1995). The certification PM level is established at 0.34 g/bhp-hr for the applicable engines using the kit.

5. Catalyst (Engelhard's CMX™), biodiesel additive and injection timing retard certified by Twin Rivers Technologies, Ltd., for certain two-stroke/cycle engines.

Two configurations of equipment are certified for applicable engines: (1) a particular biodiesel fuel additive in combination with a particular exhaust system oxidation catalyst; and, (2) the additive and the catalyst, plus retarded fuel injection timing. The certified equipment is applicable to petroleum-fueled Detroit Diesel Corporation (DDC) two-stroke/cycle engines originally installed in urban buses of model years 1979 through 1993, excluding 1990 model year DDC 6L71TA engines. The oxidation catalyst of this equipment is the CMX™ catalyst which has been previously certified under the urban bus program by the Engelhard Corporation. Biodiesel is a potentially renewable, oxygen-containing fuel. As a component of this certified equipment, biodiesel is produced from original-use plant oil sources and methyl alcohol, consists of methyl esters of specified carbon chain-lengths, and must be blended at a ratio of 20 percent by volume with the balance federally required low-sulfur diesel fuel (having a maximum sulfur content of 0.05 weight percent). This blend is referred to as "B20". Some configurations of this equipment use retarded fuel injection timing to reduce exhaust emissions of NOx.

Some configurations of this kit are certified to meet the standard of reducing PM by at least 25 percent for the applicable engines. The 1990 - 1993 6V92TA DDEC II engine models are certified only with timing retard because analysis of new engine certification data and other Twin Rivers data indicate that federal NOx standards would otherwise be exceeded with stock timing. See 61 FR 54790, October 22, 1996, for the PM certification levels assigned to different engine models.

6. Catalytic Exhaust Muffler (CEM-I™) certified by Johnson Matthey, Inc., for two-stroke/cycle engines

This kit is certified to meet the standard of reducing PM by at least 25 percent for the applicable engines (see 61 FR 16773, April 17, 1996, for the PM certification levels

assigned to different engine models).

7.      Upgrade Kit Certified by Detroit Diesel Corporation for its 6V92TA DDEC II Engines

This kit "upgrades" 1988 through 1990 model year 6V92TA urban bus engines having Detroit Diesel Electronic Control (DDEC II) fuel injection, to a 1991 model year configuration. The kit includes gaskets, cylinder kits, fuel injectors, camshafts, blower assembly, turbocharger, cylinder head assemblies, and computer program for the 1991 model year 277 Hp engine configuration.

This kit is certified to meet the standard of reducing PM by at least 25 percent, and has a PM certification level of 0.23 g/bhp-hr. (See 61 FR 37738, July 19, 1996.)

8.      Engelhard ETX-2002 kit "triggering" the 0.10 g/bhp-hr standard for 1979 - 1989 DDC 6V92TA MUI engines.

The ETX kit, certified on March 14, 1997 (see 62 FR 12166), consists of an engine rebuild "upgrade" kit, a CMX-5 catalytic converter-muffler, a proprietary coating (referred to as the GPX-5m) applied to piston crowns and cylinder head combustion chambers. The engine upgrade portion of the kit includes cylinder kits, cylinder heads, camshafts, turbocharger, blower and drive gear, fuel injectors, and gasket kit.

This equipment is certified to the 0.10 g/bhp-hr PM level, and as being available for less than the life cycle cost limit of \$7,940 (in 1992 dollars). This certification triggers the 0.10 g/bhp-hr PM standard for applicable engines.

9.      Oxidation Catalytic Muffler (OCM™) certified by Engine Control Systems for certain two-stroke cycle engines

This kit is an oxidation converter muffler to replace the standard bus muffler. It is certified to meet the standard of reducing PM by at least 25 percent for the applicable engines (see 62 FR 746, January 6, 1997, for the PM certification levels assigned to different engine models).

10.     Johnson Matthey's CCT™ kit certified to the 0.10 g/bhp-hr standard for 1979 - 1989 DDC 6V92TA MUI engines.

The certified equipment, referred to by Johnson Matthey as the Cam Converter Technology (CCT™) upgrade kit, consists of proprietary cam shafts, a CEM II™ catalytic exhaust muffler, and specified emissions-related engine rebuild parts and certain engine settings. The kit is applicable to all 6V92TA urban bus engine models made by Detroit Diesel Corporation (DDC) from model years 1979 to 1989 and equipped with mechanical unit injectors (MUI). Four horsepower ratings are available (253, 277, 294, and 325). The kit is certified to meet the life cycle cost requirements. Accordingly, the certification triggers the 0.10 g/bhp-hr standard for engines originally above 294 horsepower. (The certification of the Engelhard ETX™ kit on March 14, 1997 at 62 FR 12166, triggered the 0.10 g/bhp-hr standard for engine rated at 294 horsepower and less.)

The PM certification level is 0.10 g/bhp-hr for the applicable engines (see 62 FR 60079, 11-06-97).

11. Engine Control System's converter muffler certified for four-stroke/cycle engines

This kit is an oxidation converter muffler to replace the standard bus muffler. The converter is intended to be used only by operators using compliance option 2 to provide a 18% reduction relative to the PM levels of either the original engine configuration or of the Cummins certified rebuild kit. The applicable engines are primarily the Cummins L10 engine models.

The PM certification levels sought for the equipment vary with specific engine calibration and are provided in the application.

12. Engelhard CMX™ catalyst for 1992 - 1993 Cummins L10 EC

This kit is a catalytic muffler which replaces a standard muffler in an engine exhaust system, and is applicable to Cummins L10 EC engine models. This kit is certified to reduce PM emissions by at least 25 percent. The PM certification level is 0.19 g/bhp-hr.

Additional emissions data was provided by Engelhard on April 20, 1998, which is intended to demonstrate 25 percent reduction on all other 4 stroke/cycle engines. A Federal Register notice (63 FR 65780: 11-30-98) announces EPA receipt of the data and asks for public comment.

13. NOPEC's catalyst (Engelhard's CMX™), biodiesel additive and injection timing retard under review for certain two-stroke/cycle engines.

A notification of intent to certify that is virtually identical to, and relies on, the same exhaust emissions data of the above certification by Twin Rivers Technologies. NOPEC withdrew this application.

14.    Nelson Division exhaust catalyst for two-stroke/cycle engines.

This equipment consists of an exhaust catalyst/muffler used in place of the original muffler on a bus. It is certified to meet the 25 percent PM reduction standard for applicable engines. This equipment also complies with the \$2,000 (1992 dollars) life cycle cost requirement.

15.    Detroit Diesel Corporation Kit Certified for 6V92TA MUI engines.

This kit is intended to be certified for the 0.10 g/bhp-hr standard, and consists of the base engine components used on the 25% reduction kit certified by DDC on 10/2/95, the 25% reduction catalyst previously certified by Engine Control Systems (1/6/97), and a TurboPac supercharger system supplied by Turbodyne Systems, Ltd. The equipment is applicable to DDC 6V-92TA MUI engine models for years 1979 to 1989. No life cycle cost information is provided.

In a letter to DDC dated April 6, 1998, EPA certified this kit to the 0.10 g/bhp-hr PM standard.

16.    Johnson Matthey's Cam Converter Technology (CCT™) upgrade kit under review for 6V92TA DDEC engines.

This certified kit, referred to by Johnson Matthey as the Cam Converter Technology (CCT™) upgrade kit, is applicable to all federal and California Detroit Diesel Corporation (DDC) 6V92TA DDEC two-cycle diesel engine originally equipped in an urban bus from model years 1985 to 1993. The kit consists of proprietary cam shafts, a CEM II™ catalytic exhaust muffler, an 0.015 offset key, and specified emissions-related engine rebuild parts and certain engine settings. Two horsepower ratings are available (253 and 277). No life cycle cost information has been submitted. The offset key replaces the standard Woodruff key between the pulse wheel and camshaft, so that the injection timing is retarded.

This kit was certified by EPA letter dated October 21, 1998. A Federal Register notice was published at 63 FR 66798; 12-03-98. Johnson Matthey submitted life cycle cost information for the CCT kit on January 26, 1999.

17.    Engelhard ETX 2002 kit for 1988 - 1993 DDEC engines.



This certified kit is similar to the previously certified ETX-2002 kit for MUI engines, and applicable to all federal and California 6V92TA DDEC engines. The kit is designed to update all DDEC engines to either 253 or 277 horsepower. The DDEC version of the ETX-2002 kit uses many of the components of the DDC 6V92TA DDECII upgrade kit, along with an exhaust catalyst (CMX-5), proprietary engine coatings on the cylinder head fire deck and piston crown, and an improved turbocharger. The kit is intended to comply with the 0.10 g/bhp-hr PM standard for less than the life cycle cost limit of \$7,940 (in 1992 dollars).

While the ETX was certified by EPA letter dated July 1, 1998, and a Federal Register notice was published on December 3, 1998 (63 FR 50225), the status of this equipment and the 0.10 g/bhp-hr standard that it triggered is currently under review (January 1999).

18.    Turbodyne Systems BusPac kit for 1979 - 1989 6V92TA MUI engines.

This candidate kit is intended to comply with the 0.10 g/bhp-hr PM standard. The BusPac kit consists of the exhaust catalyst from the 25% reduction kit previously certified by Engine Control Systems (1/6/97) and a TurboPac supercharger system supplied by Turbodyne Systems. The equipment is applicable to DDC 6V-92TA MUI engine models for years 1979 to 1989. The kit requires that the engine be rebuilt to a 1988/89 OE configuration. The notification does not provide any life cycle cost information and does not intend to trigger any standards. This application is currently under EPA review.

19.    Detroit Diesel Corporation's DDEC kit for the 0.10 g/bhp-hr PM standard.

This certified kit utilizes components from DDC's certified engine upgrade kit, modified fuel injectors, conversion from DDEC II to DDEC IV engine control system, and a converter/muffler. DDC has submitted emissions data from testing using three catalysts supplied by three different catalyst manufacturers (Nelson, Engelhard, and Engine Control Systems). The equipment is applicable to DDC's 6V-92TA DDEC engine models of model years 1985 through 1993, Federal and California, 253 and 277 horsepower. Applies to diesel and methanol-fueled engines. No life cycle cost information has been supplied. This kit was certified by letter dated October 2, 1998.

20.    Engelhard ETX Plus kit for 1988 - 1993 DDEC II engines.

This candidate kit utilizes an improved CMX<sup>TM</sup>-6 integrated catalytic converter

muffler and a coated turbocharger. The other engine components are standard components for a DDC 6V92TA DDEC II 1991 - 1993 engine. The CMX-6 is intended to replace the standard muffler in the engine exhaust system. The turbocharger is a standard 6V92 turbocharger modified for improved response and airflow.

21.    Johnson Matthey CEM IV catalyst for 4 stroke/cycle engines