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DEF Baseline 2010

A Benchmarking Study on DEF Demand and Supply

by Kim Doran

In September 2010, Quixote Group, an independent market research and communications firm with a deep background in truck industry issues, fielded one of the first national studies on the state of diesel exhaust fluid (DEF) supply and demand across North America.

DEF is made up of automotive-grade urea and water. Injecting DEF into a vehicle exhaust stream through a selective catalytic reduction (SCR) process reduces nitrogen oxides (NOx) to 0.2 grams per brake horsepower hour (near-zero levels), as mandated by the Environmental Protection Agency (EPA).

The DEF Baseline 2010 benchmarking study was commissioned by OPIS (Oil Price Information Service) on behalf of its members and subscribers, including the top 200 oil companies, distributors, traders, and government and commercial buyers of petroleum products.

The study was conducted in concert with the North American SCR Stakeholders Group, an ad-hoc organization representing nearly 300 public and private entities committed to education and outreach to support the introduction of SCR. Participants included government agencies, automotive and heavy-duty engine and truck manufacturers, trade associations, fuel retailers, chemical and oil companies, DEF producers, distributors, testing laboratories, testing equipment manufacturers, and dispensing equipment manufacturers.

The study provides a benchmark of the current North American supply infrastructure for measuring future development of the DEF supply chain and its capacity for supporting and perhaps accelerating adoption of SCR-equipped vehicles. Specifically, the DEF Baseline 2010 study focused on three data points: the percentage of companies selling or dispensing DEF; the types of packaging being used; and typical wholesale or retail prices.

Respondents fell into one of three target audiences: fluid suppliers (wholesalers and distributors of fuels and fluids, including DEF); retailers (truck stops or travel plazas, convenience stores with gas stations, stand-alone gas or service stations, and other retail outlets); and fleet fueling operations (private trucking companies and fleets, truck leasing businesses, and public, municipal or government truck fleets).

To view the complete DEF Baseline 2010 benchmarking study, see www.FactsAboutSCR.com.

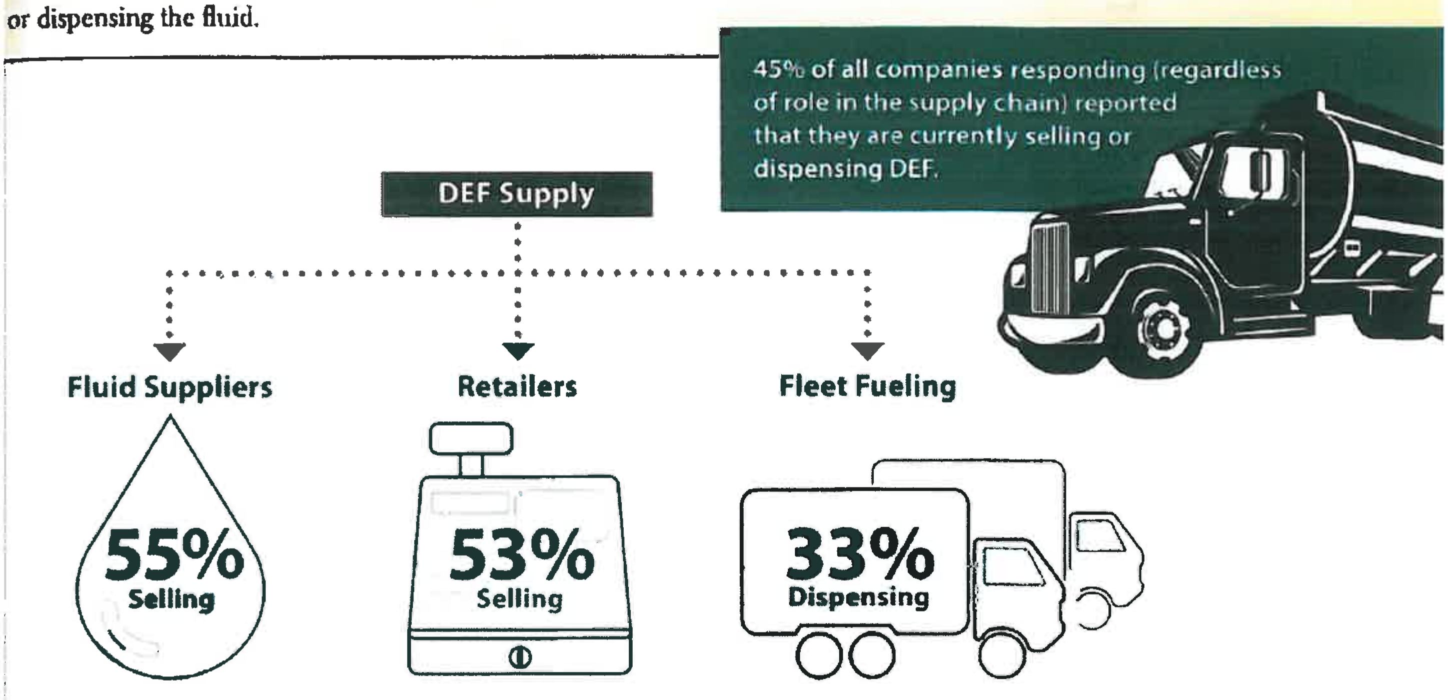
TODAY'S DEF SUPPLY

Despite being a completely new product introduced during historically challenging economic times, demand and supply of DEF in North America is outpacing the growth and development of the same product supply chain in Europe (now in its fourth year).

Approximately 45 percent of all responding companies (regardless of their role in the supply chain) report that they are currently selling or dispensing DEF. To be specific, 55 percent of fluid suppliers, 53 percent of retailers and 33 percent of fleets are currently selling or dispensing the fluid.

However, prices decrease when DEF is sold in bulk. For instance, 94 percent of fluid suppliers sell DEF in 55-gallon drums at an average wholesale price of $3.74/gallon, 81 percent sell 275- to 330-gallon totes or IBCs of DEF at an average wholesale price of $3.36/gallon, and 26 percent of fluid suppliers refill 800+-gallon mini-bulk systems with DEF at an average wholesale price of $2.24/gallon.

Study results also show that the average monthly volume of DEF sold by fluid suppliers across all package types is 1,760 gallons.



PACKAGING AND PRICING

For purposes of the study, DEF packaging formats are divided into four categories:

- **1- to 2.5-gallon jugs**
- **55-gallon drums**
- **275- to 330-gallon totes or intermediate bulk containers (IBCs)**
- **800+-gallon mini-bulk systems**

The study shows that the preferred format depends greatly on the nature of the supplier.

Fluid Suppliers. Literally all of the 55 percent of fluid suppliers that supply DEF report selling 1- to 2.5-gallon jugs of DEF. The average wholesale price for this packaging was $4.65/gallon.

Retailers. Of the 53 percent of respondents that report selling DEF at retail, 100 percent carry 1- to 2.5-gallon jugs, and those jugs are available at 90 percent of the respondents' stores. Results show an average retail price of $5.51/gallon or $13.78 per 2.5-gallon jug, with an average inventory of 26 jugs per store.

Fleet Fueling. At this early point in the adoption of SCR technologies, fleet size matters. Some 33 percent of fleet respondents report that they dispense DEF at their fleet refueling terminals—and 65 percent of that group have fleets of 150 or more trucks.

While 49 percent of DEF-refilling fleets dispense DEF from 275- to 330-gallon totes or IBCs, 12 percent of these fleets have already installed mini-bulk systems. The average price paid for DEF by dispensing fleets is

Cost Savings by SCR-Equipped Trucks

	PRE 2010	SCR TRUCK: DEF FILLING METHOD		
	No DEF Needed	**2.5 gal. Jug**	**On-island Pump**	**Fleet Fueling**
MPG	6.0	6.3	6.3	6.3
Annual miles/truck	107,000	107,000	107,000	107,000
Diesel gallons/truck/year	17,833.3	16,984.1	16,984.1	16,984.1
Average price/gallon	$2.96	$2.96	$2.96	$2.96
Total diesel expense/ truck	**$52,786**	**$50,273**	**$50,273**	**$50,273**
DEF gallons/truck/year	NA	356.7	356.7	356.7
Average price/gallon	NA	$5.51	$3.05	$2.81
Total DEF expense/truck	NA	$1,965	$1,088	$1,002
Total: Diesel + DEF	**$52,786**	**$52,238**	**$51,361**	**$51,275**
Savings per truck/year	-	**$548**	**$1,425**	**$1,511**

Sources: 6 miles per gallon—U.S. Department of Energy; 107,000 annual miles per truck—Owner-Operators Independent Drivers Profile 2008; $2.96 average price/gallon (diesel)—U.S. Department of Energy; 6.3 miles per gallon for SCR trucks—5 percent fuel efficiency gain cited by various SCR truck manufacturers; 300 miles per gallon of DEF—Cummins Filtration, DEF Q&A.

$2.81/gallon, and the average monthly volume of DEF purchased per truck fleet is 412 gallons (enough to support a total of 123,600 truck miles per month).

COST SAVINGS FROM DEF USE

The DEF Baseline 2010 study also determined the cost savings realized by SCR-equipped trucks, based on current DEF pricing across all packaging formats. Even during this early introduction and adoption stage for SCR vehicles—when pre-packaged DEF is the format most uniformly available on the road—truckers still save on operating costs with SCR-equipped vehicles. The savings grow much larger when truckers can buy DEF at bulk prices at fuel islands or refilling fleet pumps.

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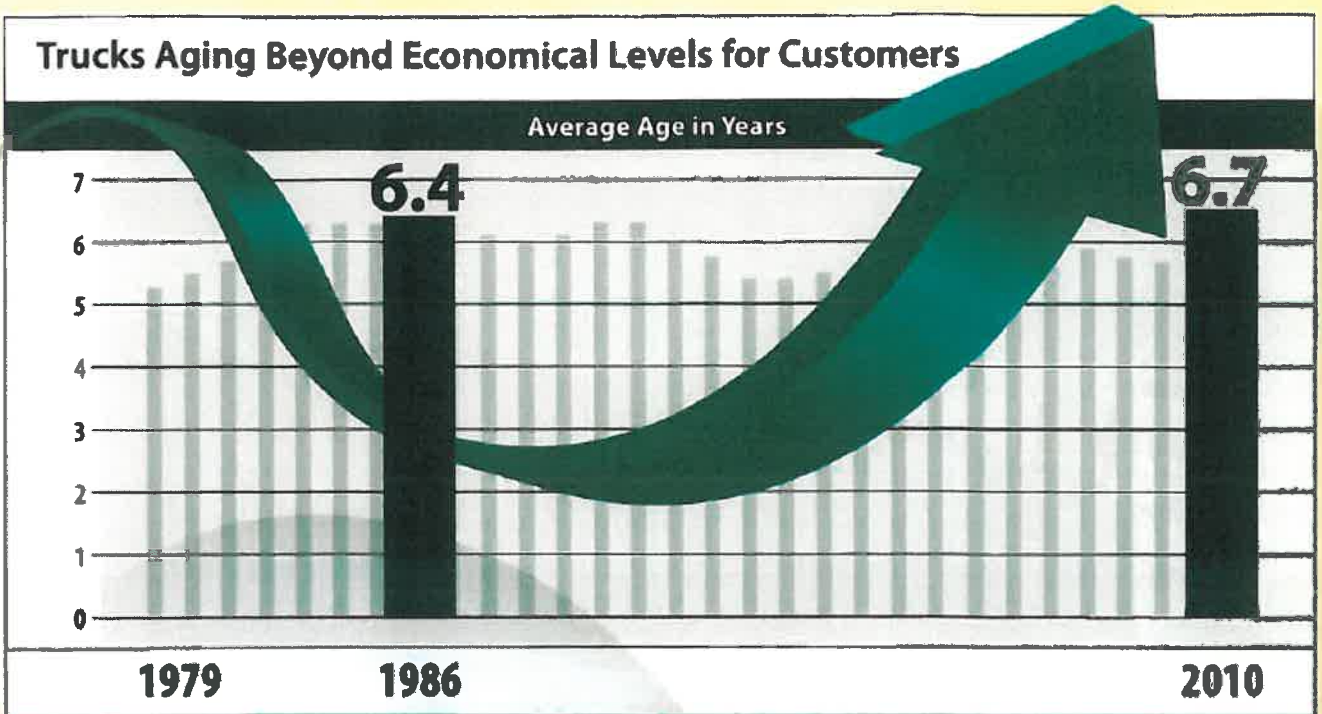
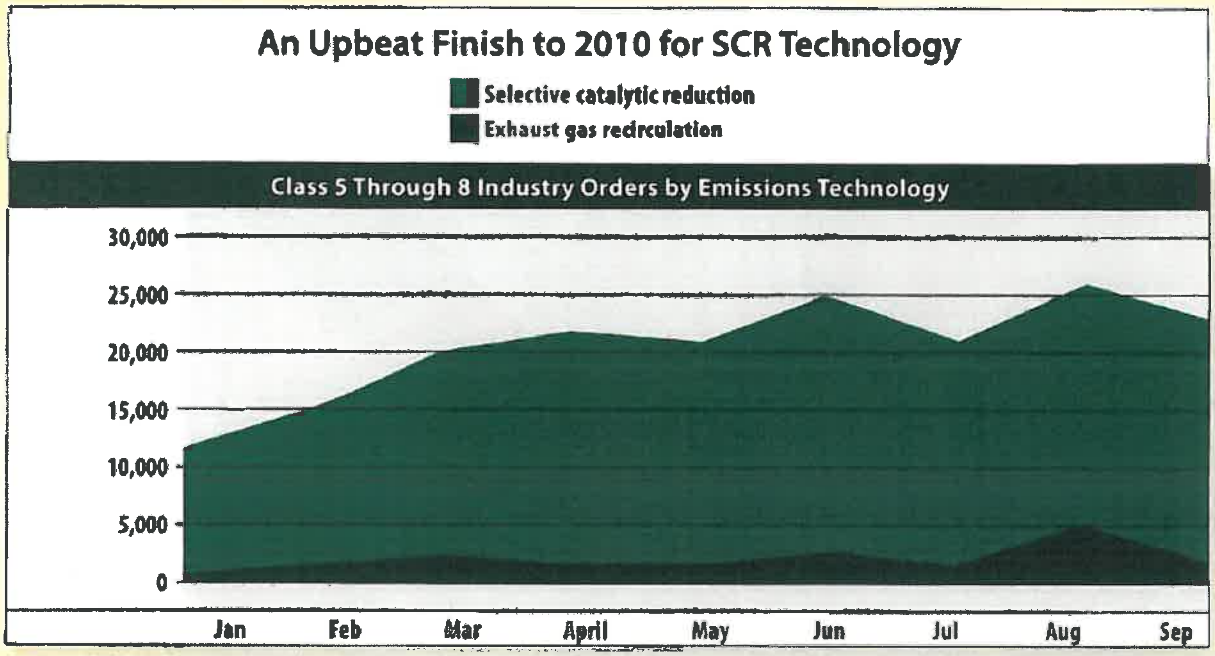


The average age of the U.S. Class 8 fleet is 6.7 years, which is about 11 months older than the historical average and the oldest going back to 1979. An average fleet age of more than five years is significant, as maintenance costs increase significantly beyond 500,000 miles (after which point warranties expire).

Source: ACTR Research Co., LLC.



Source: Polk truck registration data, courtesy of Daimler Trucks North America, Diesel Emissions Conference, October 2010.

CONCLUSION

While pre-packaged DEF supplies will always be needed, the bulk future for DEF is closer than one might think. Major truck stop chains, including Pilot, Flying J, TA, Petro and Love's, already are offering DEF in bulk on some fuel island pumps at prices under $3.00/gallon. Truckers can log on to online locators, such as www.discoverDEF.com, to find DEF availability at 75+ bulk fuel island pumps strategically located along the busiest North American freight transport corridors.

A steady increase in SCR vehicle sales is supporting the ramp-up. Mid-year 2010 reports showed SCR-equipped vehicles are being purchased five to one over non-SCR vehicles. These sales will drive DEF demand. Increased DEF demand will be further supported by new Tier 4 SCR emissions mandates in the off-road machinery, agriculture, locomotive and marine sectors.

As more trucking companies and owner-operators replace aging fleet trucks with SCR trucks, economies of scale and points of bulk DEF distribution will increase. Along with that growth, DEF dispensing and storage technologies will continue to advance, and North America will lead in the development of an entirely new equipment industry and supply chain for DEF.

To view the complete DEF Baseline 2010 benchmarking study, go to www.FactsAboutSCR.com.

Kim Doran is CEO of Quixote Group, www.quixotegroup.com, and editor of FactsAboutSCR.com.
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