



While
you focus
on the
finish line.

We focus
on your
bottom line.



Accelerate Your Performance With A Powerful Team

In the challenge to make clean fuels, knowledge truly is power. Knowing how to analyze the clean fuels problem, assess the variety of potential solutions and avoid the possible pitfalls provides the power to define the optimum, cost-effective answer. The key issue for each refiner is where to find the knowledge needed to create the right solution for the specific situation. Many companies are offering “answers,” but can you depend on them to deliver a reliable, cost-effective result? Criterion Catalysts & Technologies (CC&T) and its technology affiliates – Shell Global Solutions and CDTECH – have labored over the past decade to gain the tools and experience that will ensure we can be the team you turn to for the most cost effective, reliable Clean Fuels Solutions. Our goal is to be your **Clean Fuels Team** – the team you can depend on for the knowledge, answers and results you need.

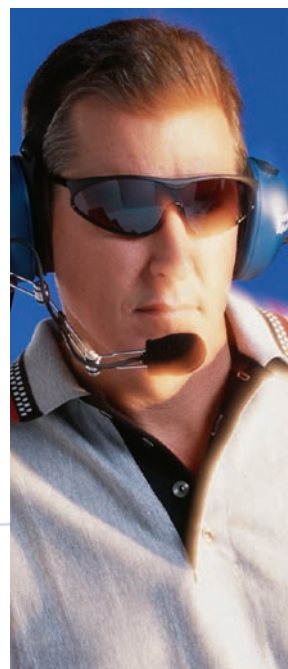
Leave The Driving To Us

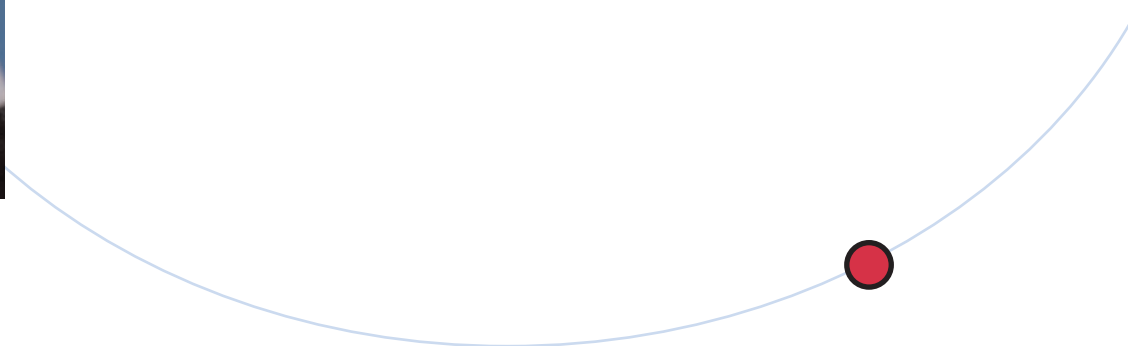
To successfully meet the Clean Fuels Challenge, you need a team that will listen to your needs and ideas and use its knowledge and experience to deliver innovative, cost-effective solutions that keep you ahead of the pack. That is exactly what our Clean Fuels Team is trained to do. We recognize that no two refineries are the same, and therefore, we do not believe in a “cookie-cutter” approach. We study each customer’s situation to determine what options make the most sense. In each case, we want to evaluate the total picture – the whole refinery, not just the processing operations – to make sure our solutions are cost effective for you. Additionally, we look beyond the immediate challenges to develop solutions that will fit with tomorrow’s reality so that you are not left with a stranded investment. Lastly, our objective is always to put as much of your existing assets to work as possible – we realize the most cost-effective returns are achieved with the lowest investment and fastest implementation.

A Full Pit Crew At Your Service

Our set of tools, unmatched by any other team in the business, helps you find and successfully implement the best Clean Fuels Solution. Among our offerings are the world’s largest database of hydroprocessing information, computer models built

on real experience, and five major research centers that can perform the testing and analysis necessary to make the right decision. Here are a few of the other tools – from concept through implementation – that are available from the Clean Fuels Team to create the customized solution you need.





Operations Analysis and Planning

Our refining team can analyze your operations, identify opportunities and help you achieve more with your existing assets.

- **Benchmarking and Performance Monitoring Program:** Deliver pragmatic analysis that enables meaningful goal setting and continuous improvement (over 80 plants now participating).
- **Pacesetter Program:** Optimize utilization of existing assets with little or no capital investment.

Typical gains have been:

- 2-5% higher plant availability
- 10-30% higher processing margins
- 20-40% lower maintenance costs
- 10-25% lower energy usage

Products and Services

Our products and services help you get more from your investments.

- **Hydroprocessing and reforming catalysts with industry-leading performance for fuels production:**
 - Naphtha Reforming Catalysts
 - Isom and Alky Pretreating
 - Naphtha and Distillate Hydroprocessing
 - FCC Pretreating
 - Hydrocracking/Mild Hydrocracking
- **CAT360sm Catalyst Management System:**
 - Regeneration
 - Presulfurization
 - Catalyst Handling
 - Spent Catalyst Reclamation
 - Logistics Management
- **Reliability and Maintenance Program (MERIT):** Reduce downtime and maintenance costs.
- **Energy Optimization and Loss Abatement Program:** Reduce your energy costs and get more capacity.

Technologies

- **Process**

Our team can provide process designs for making clean fuels that minimize capital investment and operating costs.

CDHDS[®] and CDHydro[®] for producing low sulfur gasoline using patented catalytic distillation.

SynSat and SynShift for producing ULSD, low aromatics, high cetane diesel fuels at low-to-moderate reactor pressure.

Hydrocracking for converting high sulfur, high aromatics feeds to clean fuels.
- **Hardware**

Our team has the most modern, efficient hardware for revamping exiting equipment to increase capacity and reduce energy usage, emissions and operating costs.

High Dispersion (HD) reactor trays to improve flow distribution, providing 5-10% capacity increases.

Ultra Flat Quench (UFQ) devices to decrease radial ΔT s and provide 10-15% capacity increases.

HiFi Calming and Consep trays to improve column separation efficiency.
- **Software**

Our team can offer advanced process control technology to improve reliability, operating costs and environmental/safety performance.

Operations Support

- **Commissioning and Start-Up Services**
- **Catalytic Technical Services**
- **Refining Technical Advisory Programs**

Years Of Experience At Every Turn

You want solid solutions without worries and complications. We believe the extensive, in-depth experience of our Clean Fuels Team in refining operations and making fuels can guarantee this outcome.

- CC&T is the largest supplier of hydroprocessing catalysts, with a portfolio that covers all applications ranging from light ends to the bottom-of-the-barrel. This gives us the world's largest database to rely on for answers.
- We have been in the forefront of making cleaner fuels for many years.

35 units making use of the team's products and services continue to successfully produce the cleanest diesel fuels in the world today.

More than 20 CDHydro® and CDHDS® units have proven their cost effectiveness and reliability to make quality gasoline blending components.

- **Team members provide real operating experience and outstanding project execution skills.**

Shell Global Solutions advises 58 refineries around the world, has developed some of the world's leading refining technologies and has implemented innumerable projects, including more than 60 successful reactor revamps.

ABB Lummus Global is a leading worldwide engineering company providing a full range of project capabilities.

You'll Finish In First Place

So, what does all this mean for you? The skills and tools our Clean Fuels Team offers translates into cost-effective, reliable results for you. Whether it's a feasibility study, a revamp or a Greenfield project, we are the team you can turn to for fast, dependable answers. Here is an example of how we have squeezed more capacity out of an existing unit with very little capital.

	Existing Reactor	Revamped Reactor
Reactor Volume, m3	150	150
¹ Reactor Utilization, %	67	86
Catalyst Volume, m3	100	129
² Catalyst Utilization, %	80	99
Catalyst In Use, m3	80	128
³ Catalyst Activity (RVA)	100	140
Effective Catalyst Volume, m3	80	179

¹New distributor and quench required less space and reduced radial ΔT s.

²New distributor and improved catalyst loading eliminated flow maldistribution.

³Newest generation catalyst installed.

Our Clean Fuels Team is ready to show you how we can help you produce tomorrow's fuels and get better bottom-line results that you can count on. Please give us a call (see back cover) and get ready to boost your performance and operational efficiency.



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