



CLEAN OIL  
BRIGHT IDEAS

## CJC™ Application Study

Application Study  
written by:

Justin Stover  
C.C.JENSEN Inc.  
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### CUSTOMER

One of the lowest-cost electricity producers in the Western United States, providing power to approximately 1.7 million customers.

### SYSTEM

The twin combined-cycle gas turbines are capable of generating 300 MW of electricity in total.

**System:** 2 x GE 7FA Gas Turbines 150 MW  
**Gas turbines:** Installed 2006  
**Fuel:** Natural Gas  
**Power:** 150 MW  
**Lube oil:** Conoco Diamond Class ISO Grade 32  
**Oil reservoir:** 6,000 gallons (22,700 L)  
**Oil operating temp.:** 130°F (54°C)

### PROBLEM

The plant was aware of possible varnish problems and diligently monitored the lube oil. The oil was clear for about 3 years. Thereafter, varnish potential indicators began to rise rapidly into the 'abnormal' to 'critical' range. The first attempt at preventing varnish was the use of electro-static filters. These were not effective due to the high oil temperatures in the reservoirs, which dissolved the varnish. Other varnish removal systems were evaluated. Each unit was installed in a kidney loop configuration to the main oil reservoirs. The manufacturers promised rapid results in lowering varnish potential, but the reductions took months. Each system was only able to reduce the varnish potential to a reasonable 'monitor' range.

### SOLUTION

**CJC™ Varnish removal Unit, VRU 27/108 PV with CJC™ Varnish Removal Inserts, VRi 27/27.**

### RESULTS

Samples were drawn at the inlet and outlet of the VRU to monitor performance. **The MPC value dropped from 22 to 2 in the first pass.** After three days the MPC value at the inlet, indicative of the entire lube oil system, dropped to 20. After 3 weeks, the MPC value at the inlet dropped further to 2.

### BENEFITS & SAVINGS

Research by the plant staff confirmed that the unique abilities of the CJC™ VRU effectively removes varnish. If varnish is not removed the servo valves become sluggish or fail to operate, leading to a trip of the unit. **Unit trips can cost between \$50,000 and \$250,000.** Extended intervals between oil changes will save thousands of dollars. Furthermore, there is little need to conduct detergent flushing to remove varnish prior to adding new oil. With much lower MPC values it is expected that any varnish, which is in contact with the oil, will be dissolved and further varnish build up will be prevented. The end result of using the CJC™ VRU will be a greatly reduced potential for unit outages due to failed or sticking servos, improving availability and reliability of the units.



The Combined-Cycle Generation Power Plant in Western USA



CJC™ Varnish removal Unit VRU 27/108 PV installed

### SAMPLES

MPC ΔE Membrane Patch Colorimetric	Before CJC™ VRU	After CJC™ VRU
Baseline MPC	22	3
3 weeks after start-up	5	2

### RESULT

MPC ΔE Membrane Patch Colorimetric	Before CJC™ VRU	After CJC™ VRU
Baseline	22	3
3 hours after start-up	17	3
24 hours after start-up	20	3
3 weeks after start-up	5	2

### COMMENTS

**Plant Manager:**

"The CJC™ VRU is distinctive in its design. During operation, we saw rapid results in less than 3 weeks. It reduced the MPC values down into the very low end of the normal range at the inlet to the CJC™ VRU. The CJC™ VRU is very effective."