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**To :** Anita Scordia EPA Victoria **Date:** 17 August 2018  
**From:** Les Harman Qenos Senior Environmental Adviser **Pages:** 3  
**Subject:** Total Steam Failure with smoking flares

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**Date:** 3/7/18

**Qenos Incident Report:** 304444

**EPA Reference No:** 200195074

**Date:** 3/7/18

**Nature of Incident:** Qenos Olefins flares had significant smoking for 40-50 minutes when the site had three boilers shutdown as a consequence of an unplanned SCAL-2 plant shutdown that required significant flare use. With three boilers shutdown there was insufficient steam to maintain smokeless combustion during the unplanned SCAL-2 shutdown.  
Qenos notified EPA and City of Hobsons Bay about the flare smoking

### Incident Summary:

When the SCAL-2 plant compressors shutdown (at 07:04) the total steam load reduced from 140 t/hr to 90 t/hr. All four boilers including cogeneration were on line at the time. The steam header pressure began to rise as the boiler control systems were not able to reduce steam production to match the load reduction.

To manage the load reduction, a number of steps were taken to reduce steam production, including shutdown of the cogeneration boiler duct burner and shutdown of a burner on boiler SG892 and manually reducing the firing rate of boiler SG891.

At 07:19 boiler SG-891 tripped off line.. At 07:22 boilers SG-890 and SG-892 tripped off line as their control systems attempted increase the load to maintain high pressure steam supply.. The medium pressure steam supply which is used for flare smoke suppression was unable to be maintained from 07:30 causing both flares to smoke.

The operators had difficulty in relighting the cogeneration duct burner which took between 07:23 and 07:54 and multiple attempts before successfully relighting them after diagnosing a problem at the local control panel.

From 07:34 multiple attempts were unsuccessfully made to relight SG-892. SG-890 @ 07:40 was relit after one unsuccessful attempt.



The steam headers pressure starts to re-establish with the medium pressure steam back to normal at 08:18 with the main steam supply pressure returned to normal by 08:40.

The SCAL-2 feed-rates were reduced to minimum as part of the response to the plants compressor trip, and the SCAL-1 feed-rates were reduced to minimum which is the procedural response to the loss of steam supply.

The level of flaring reduced as the feed-rates were reduced and once the steam supply was re-established smokeless flaring was achieved. The flare smoking event estimated at 40-50 minutes was between 07:30 and 08:20 when the medium pressure steam was low.

Trouble shooting on boiler SG-892 after steam supply was established identified that there was significant fouling in the pressure regulator internals on the minimum pressure maintaining valve for the fuel gas.

## Environment Assessment

### Environmental impact:

There was significant flare smoking for 40 to 50 minutes. One community complaint was received about flare smoking and odour. Without the smoke suppression system operating as designed the combustion efficiency is lowered resulting in higher VOC emissions from the flare.

It was also a licence non - compliance which was reported to EPA

### Environment Risk Assessment:

Likelihood:	B	0.1 to 0.01 per annum
Consequence:	II	Significant Impact
Risk Rating:	3	Medium risk level

## CAUSES AND ACTIONS

### CAUSE:

The steam demand following the SCAL-2 shutdown was lower than the minimum load of the four on line boilers. Energy efficiency projects implemented that have reduced steam demand significantly since 2013 have made this scenario possible. This scenario is not captured in procedures, which are focussed on ensuring that adequate steam supply is maintained.

<b>Action</b>	Develop response procedures to increase steam demand in preference to shutting down boilers when steam load is too low.	<b>Status</b>	Due 31/1/19
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**CAUSE:**

The cogeneration plant duct burners were unable to be relit when needed due to a trip condition being active. There was an active alarm at each restart attempt "burner condition not present" but the operators were not aware that this was preventing the restart

<b>Action</b>	Cogeneration owner to provide guidance around what can trigger this alarm being present and what actions are to be taken to get out of alarm.	<b>Status</b>	Due 31/12/18
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<b>Action</b>	Train utilities operations about the BMS panel and how this can be useful in troubleshooting in the event of a cogen trip	<b>Status</b>	Due 31/12/18
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**CAUSE:**

Fouling inside the regulator of the minimum pressure containing valve on boiler SG-892 caused inadequate fuel gas supply to get the boiler relit.

<b>Action</b>	Update the maxi I&E procedure on all boilers to include the checking and cleaning of the minimum maintaining valve and regulator	<b>Status</b>	Due 31/12/2018
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<b>Action</b>	Pre-emptively clean the minimum maintaining valve on SG-890 prior to the MAXI on SG-891 planned later this year	<b>Status</b>	Completed
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**CAUSE:**

Rapid transition to almost pure natural gas firing of the boilers will have changed flame shape, which was unable to be detected by the flame eyes. Tripping of burners is to ensure a safe condition as it prevents fuel gas addition to the boiler firebox with no ignition source. During this transition and the high O2 added as the boilers tried to increase rates resulted in the flame eyes unable to see the changed flame shape &/or a flame out condition occurred..

<b>Action</b>	Review flame stability across the possible range of fuel gas composition and determine if improvements can be made to flame eye sensors during high natural gas events. If no improvements are possible then provide procedural guidance/training for high natural gas scenarios.	<b>Status</b>	Due 31/1/19
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