**Alpine Export NZ Ltd 26th. September 2019**

**Memorandum**

**From : Ron Russell**

**To: Jason, Neville & Mark, (Alpine) / Chris Brewer (BOPRC) / Peter Stacey (AECOM) /**

**Paul Williams(Medical Pacific)**

**Review of options available for increasing OZONE dwell time & OZONE concentration**

Dwell time currently about half a second. Air is discharged at 15m/second in flues that are about 7.5m in length from oven to top of flue

There is ample scientifically documented evidence saying all biological odours are able to be removed with OZONE & if all odours are not removed this can be remedied with increased concentration &/or increased dwell time. Alpine’s odours are Biological.

**INCREASED CONCENTRATION**

* Trials are underway using oxygen instead of atmospheric air to generate OZONE. This will increase the OZONE generation capacity by three to four times. These trials are likely to continue for a week or two whislt results are being monitored at various concentrations.
* Oxygen cylinders are being used as a source of oxygen for the trials. If successful it is likely that the recommendation will be to import Oxygen Concentrating equipment from Europe, USA or China. Current advice is that it would be viable to continue using Oxygen cylinders for an indefinite period.
* Current advice is to use Oxygen cylinders at least until options to increase dwell time have been explored. If increased dwell time trials prove successful, it may be possible to either dispense with Oxygen concentration, or more likely reduce the size of the Oxygen Concentrators imported. There is no risk in delaying the import of equipment because the same results can be achieved with Oxygen Cylinders from BOC ex stock at Mt Maunganui. With oxygen cylinders it will be able to determine how much, or how little Oxygen is required. It would be feasible to produce concentrated oxygen 24/7 into a buffer tank, this would reduce the size of the Qxygen concentrator required

**INCREASED DWELL TIME**

* Currently the flues are 490mm diameter & about 7.5m long (1.5m original length with 6m extension x 499mm diameter)
* Exhaust air travels about 15m/sec , so dwell time is about half a second
* Cubic size of existing flues is about 1.4 cu.m (3.14 x 0.25 x 0.25 x7.5)
* One consultant claimed dwell time should be 10 seconds, but this statement does not appear to be supported by any of the research papers that we have reviewed. Different odours have different characteristics, it is likely the dwell time differs accordingly.
* Rather than trial small dwell time increments it is proposed to design a system that achieves a minimum of twenty times the current dwell time, or a 10 second dwell time.

Possible options

1. Install extended ducts with much larger internal cross-sectional area than the current flues.
* Current flues are 500mm diam
* If 800mm diam ducting was used the length would need to be at least 60m in length to achieve 20 times longer dwell time
* Would need to mix air whilst in the pipe ‘
* A vertical flue at the exhaust end would probably be required
* Would need to devise a way to drain condensate
1. Build an air retention box on the roof above Alpine’s packing area
* This is a very substantial structure with a large gantry crane facility. This Gantry frame could be used to support the exhaust retention box
* The available area is about 10m x 10m, if the structure was 2.4m high the available cubic capacity would be 240m3, or 34.2m3/oven, or 24.4 times increased dwell time.
* The structure could be SS, PIR panel, or any other material that the company’s engineers recommend
* The existing flues could be used to exhaust the air after travelling through the retention box channels fitted with baffles to mix the air as it flows through the air retention box
* Need to get costs of the various options & if practical build one unit as a trial to be certain it achieves the objectives.

Monitoring

* AECOM have agreed to calibrate & train a resident living above the plant who has agreed to maintain regular odour checks
* Neville will continue the detailed monitoring that has been running for several weeks.
* The company has also employed a person to monitor odours in addition to Neville & the AECOM trained person

Ron Russell

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