
Achieving Water Quality Compliance

From RO Design, Installation & Monitoring

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Presentation Overview

Discussion of microbial results from a real life experience with a brief overview of RO system design but concentrating on 3 commonly asked questions:

- 1) What should I monitor?
- 2) Where should I monitor?
- 3) How often should I monitor?

RO System Design & Installation

The RO system used in this case study is a purpose built system with weekly automatic sanitisation of the storage tank, distribution loop and its components.

There are three common sanitisation processes:

1. Chemical sanitisation
2. Ozone sanitisation
3. Heat sanitisation

This case study was based on a heat sanitised RO system

Based on our site experience and other similar projects, I **MUST** emphasise the **IMPORTANCE OF AUTOMATIC SANITISATION** at least once per week to control bacteria and endotoxin.

What Should I Monitor?

- Amended AS/NZS 4187:2014 (page 55)

Softened, filtered, demineralized, reverse osmosis or distilled water shall be provided in accordance with the requirements specified by the equipment manufacturer (see Clause 6.2).

TABLE 7.2
WATER QUALITY USED FOR PROCESSING RMDs

Substance	Maximum concentration levels	
	Cleaning process	Final rinse*
Appearance	Clear, colourless	Clear, colourless
pH		5.5 8.0
Conductivity at 25°C		30 µS/cm
Total dissolved solids [TDS]		40 mg/L
Total hardness [CaCO ₃]	60 mg/L	50 mg/L
Chloride [Cl]	120 mg/L	10 mg/L
Lead [Pb]		10 mg/L
Iron [Fe]		2 mg/L
Phosphate [P ₂ O ₅]		0.2 mg/L
Silicate [SiO ₂]	2 mg/L	0.2 mg/L
Total viable count [cfu/100 mL]		100
Endotoxin [EU/mL]		0.25

* The term final rinse refers to the final water rinse conducted on the RMD.

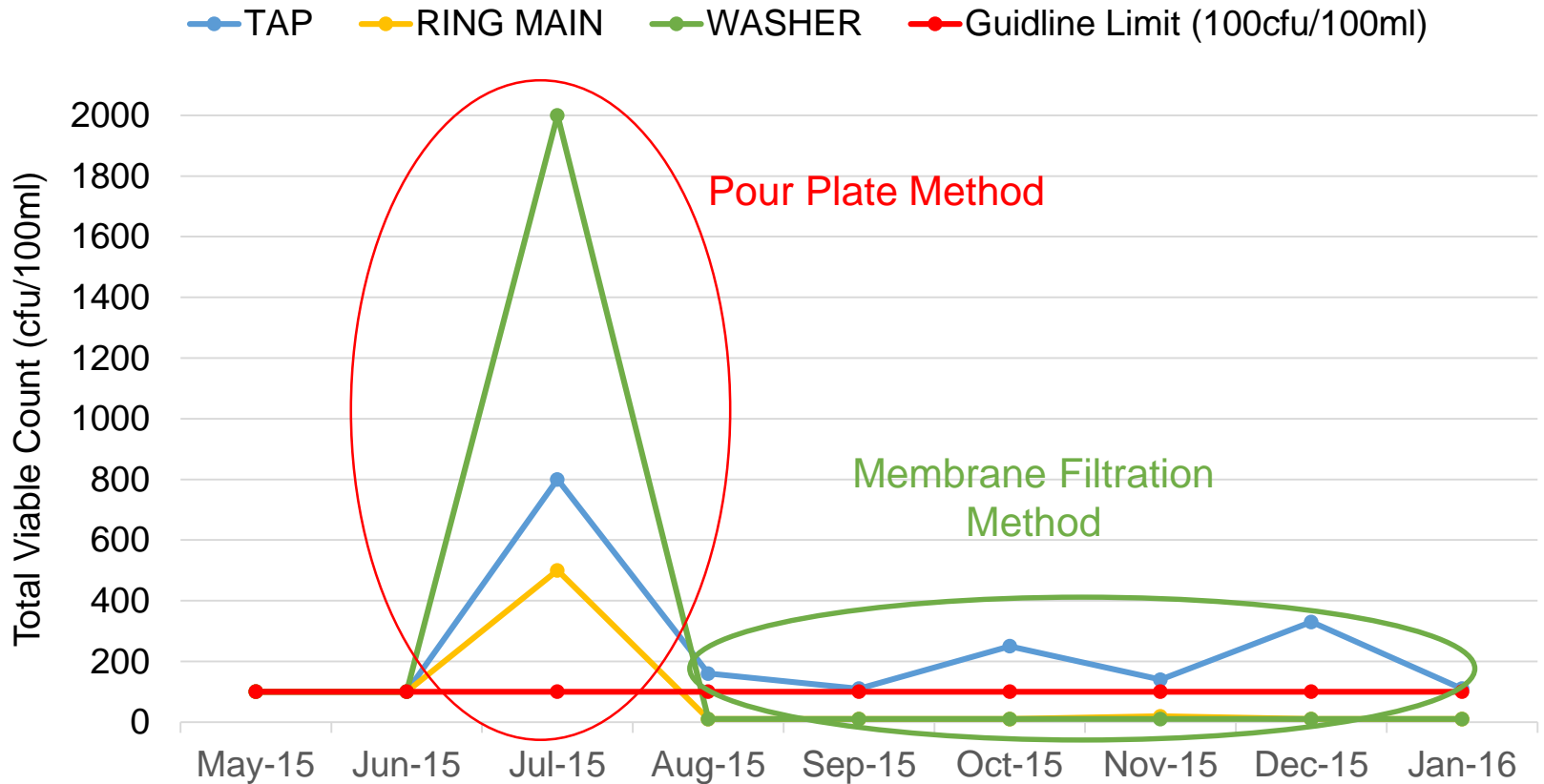
The data in Table 7.2 was adapted and modified from:

Department of Health [UK] (2013), *Choice Framework for Local Policy and Procedures 01-01 Management and decontamination of surgical instruments (medical devices) used in acute care*, Part D: Washer-disinfectors.

What Should I Monitor?

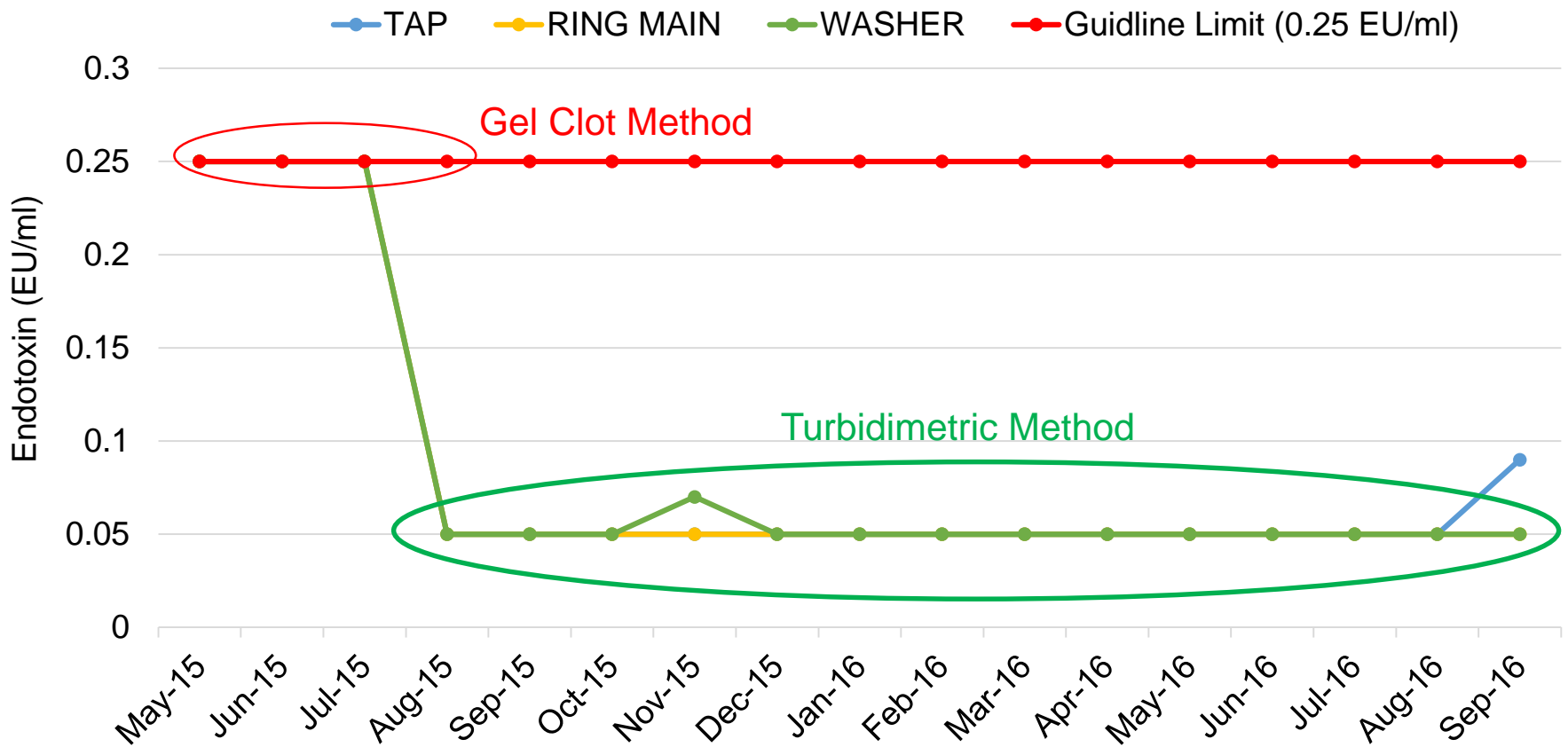
- Use analysis methods which are fit for purpose:
 1. to understand what is occurring within your system
 2. so that you can be in control to ensure your system continuously meets compliance
- Bacteria were analysed using:
 1. Pour Plate Method where 1ml sample is taken and then multiplied by 100 to get cfu/100ml.
 2. Membrane Filtration Method where bacteria are retained on the surface of a 0.45µm membrane filter and then transferred to a culture medium to grow and subsequently be counted.
- Endotoxins were analysed using:
 1. Gel Clot Method – Qualitative analysis to show whether a known concentration of endotoxin is present. In this case the guideline limit of 0.25 EU/ml was used – this method gives a positive or negative result
 2. Turbidimetric Method – Quantitative analysis which gives us numerical readings

Total Viable Count



The Pour Plate was not a suitable method for this application as indicated by the results. The bacteria level in the WD tank maintained at 70°C was greater than the other two points. Whereas membrane filtration method gave a better representation of what is occurring in our system.

Endotoxin



The Gel Clot Method did not tell us what is happening within our system.

Whereas Turbidimetric Method gave us a clear indication of system performance.

Where Should I Monitor?

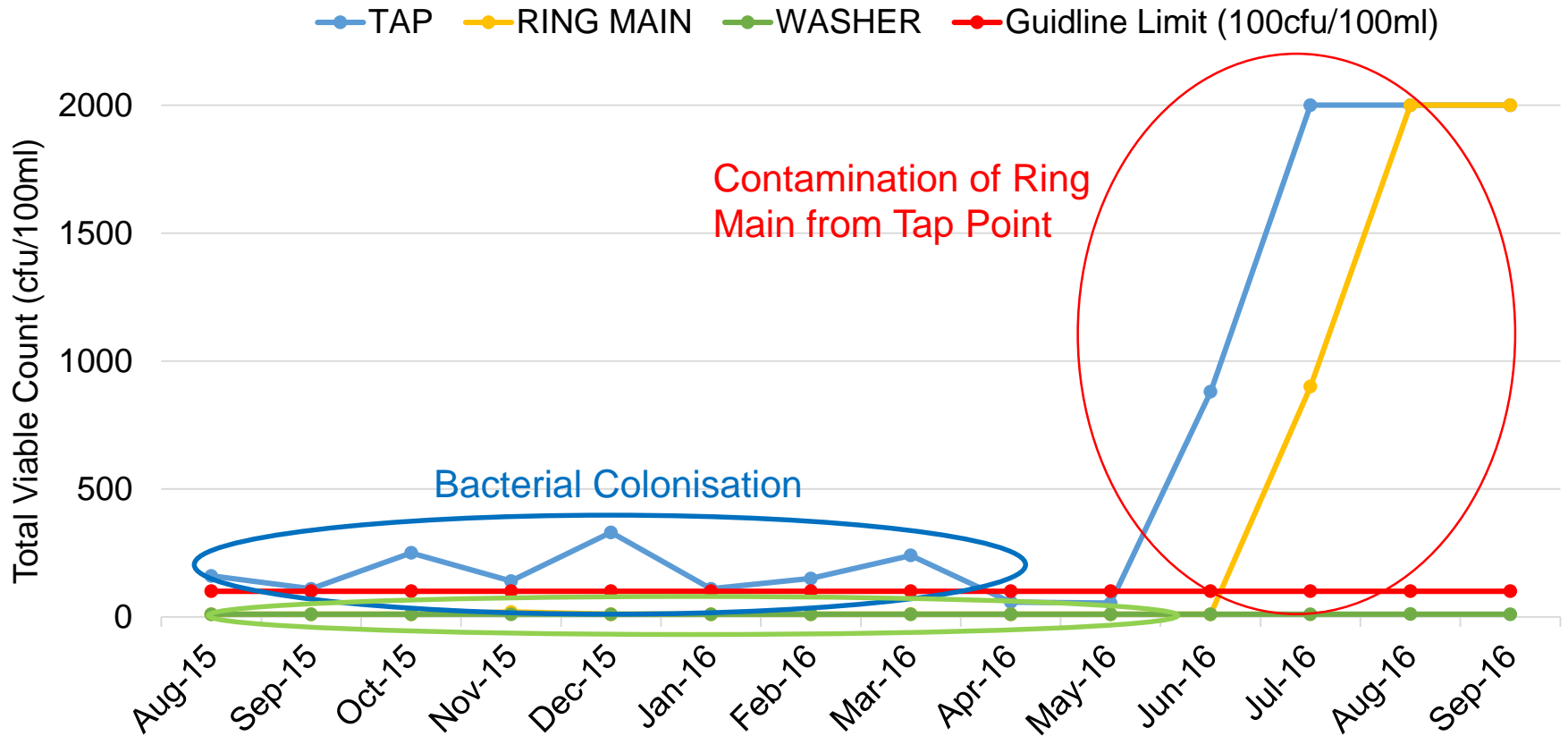
In the beginning

- As many locations as it takes to know your system (establish interpretable baseline data)

Routine monitoring

- 2-3 locations throughout your system
 - 1 x location post RO (ring main inlet)
 - 2 x locations coming off the ring main (RO taps, washers)

Where Should I Monitor?



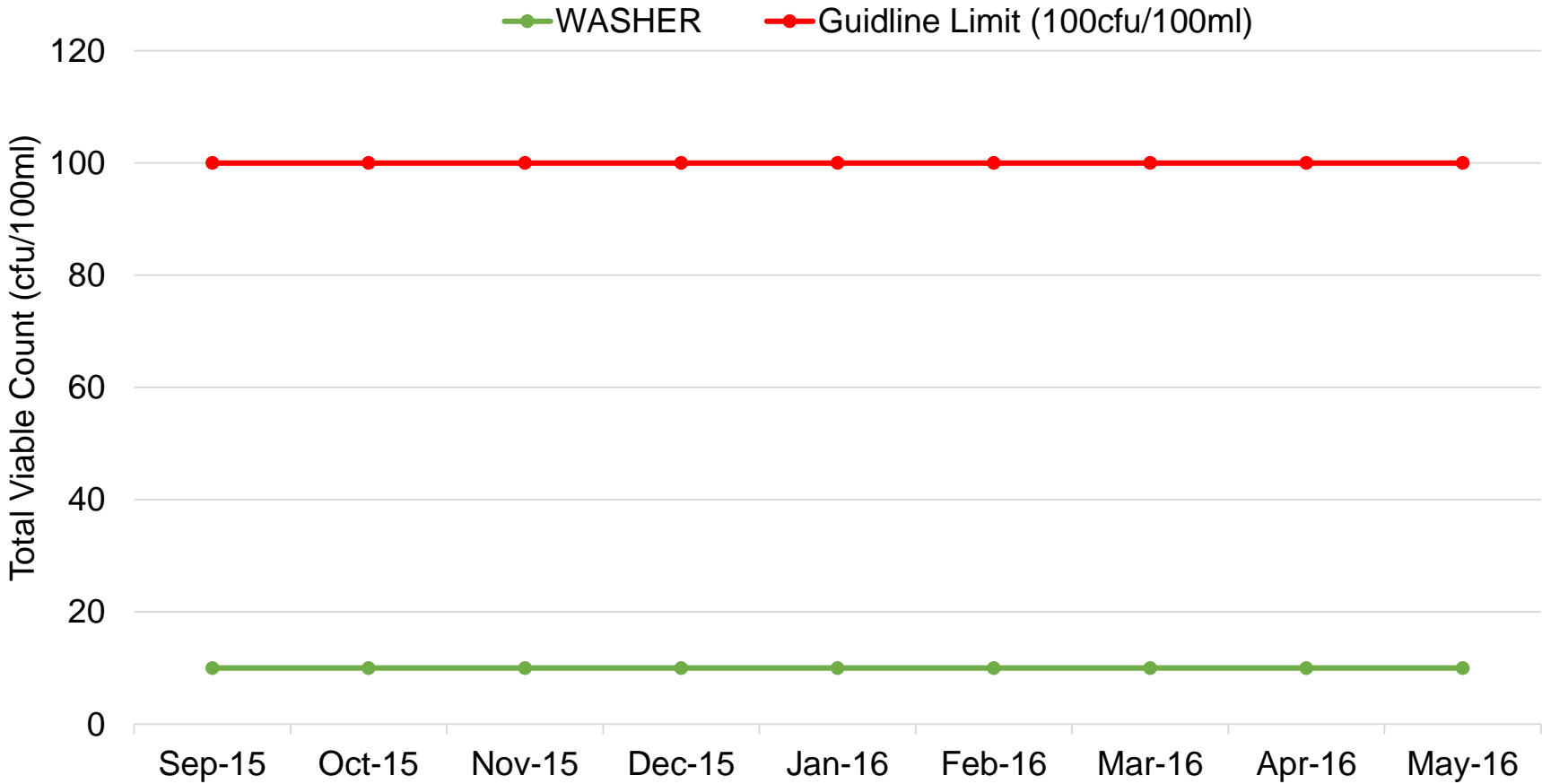
We are monitoring three points, RO tap, Ring Main and the Internal Tank in the Washer which is maintained at 70°C. The RO Tap Point indicated bacterial contamination whereas no bacteria growth was found in the Washer. Samples taken from May to June showed that cross contamination from the RO Tap to the ring main has occurred.

How Often Should I Monitor?

AS/NZS 4187:2014

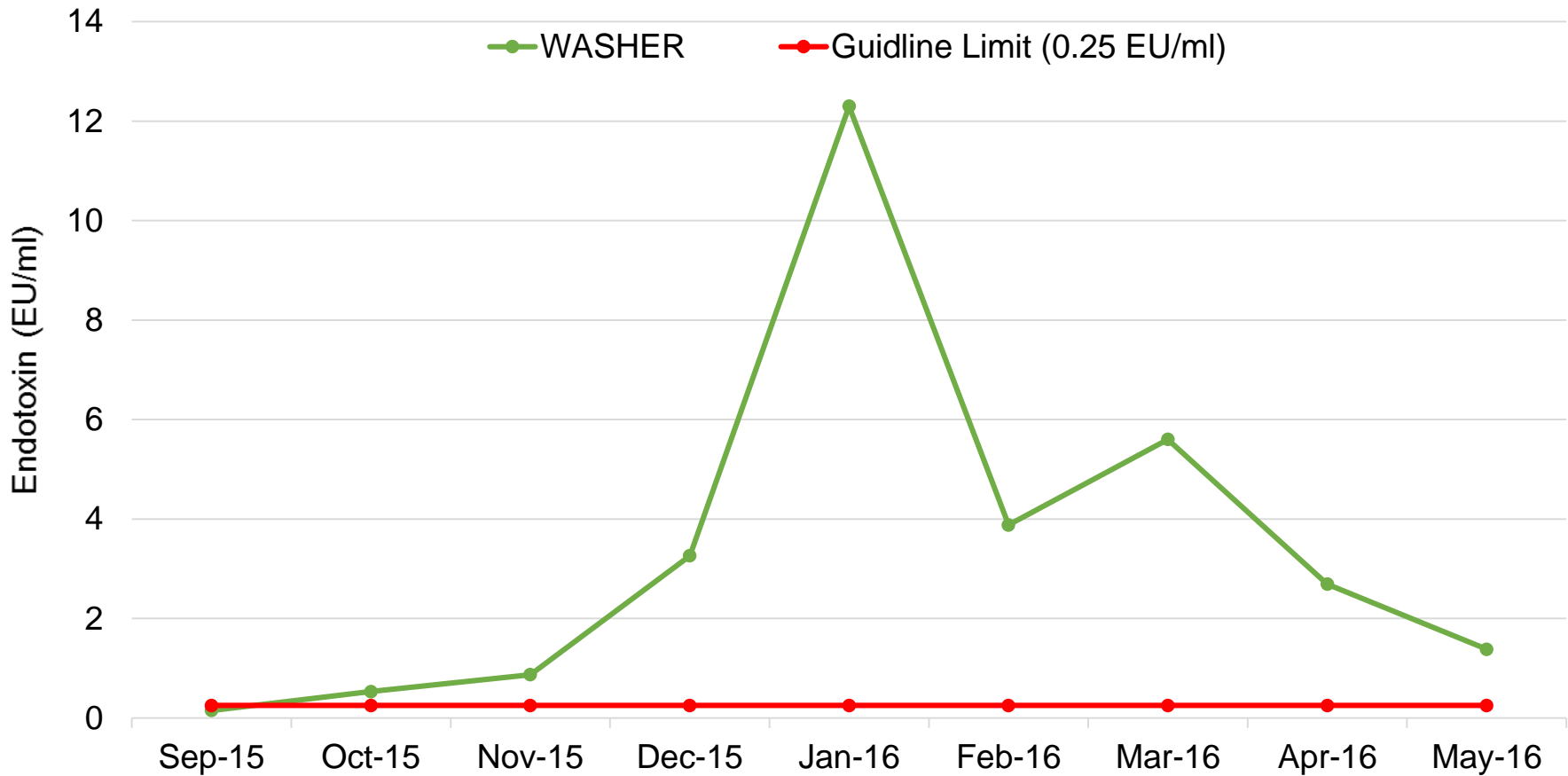
- Final rinse water monitored monthly
 - All parameters at each sample point
 - All parameters every month

How Often Should I Monitor?



Monthly monitoring indicated that the total viable count remained low, way below compliance limit.

How Often Should I Monitor?



Endotoxins levels were consistently above compliance limit. A sure indication that accumulation of endotoxin has occurred in this tank.

In Summary

- Monitor your system to gain a baseline of data
- Monitor across your system
- Monitor with methods fit for purpose
- Monitoring continuously gives you a proactive approach
- Compliance is met by ongoing monitoring as this identifies issues which may result in non compliance

So keep, monitoring, monitoring to be in control of what is happening in your system...

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