

Opportunity to review red meat regulations to promote water efficiency

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1 Executive summary

A resource efficiency benchmarking study conducted by the International Finance Corporation (IFC) and South Africa's Red Meat Abattoir Association (RMAA) in 2020 identified significant opportunities for improved water and energy efficiency for South African abattoirs when compared to international best practices. Some of these opportunities require a review of the relevant regulations to promote the improved water efficiency. The approval of an **alternative steriliser method** such, as on-demand spray or UV sterilisers, could result in national **water savings of up to 200,000 cubic meters per annum and cost savings of R10 million per annum**. Similarly, the approval of **water reuse in abattoirs will unlock significant water saving opportunities**. The following document highlights the rationale for the review of the regulations related to resource efficiency to promote water efficiency and therefore enable an improved competitiveness and sustainability of the red meat abattoir sector.

2 Background and objective

Water scarcity, greater water demand and changes in water supplies due to climate change are severely affecting large parts of Southern Africa, including South Africa, posing a significant risk to the region. In South Africa, it is estimated that water demand will exceed supply by 17% by 2030.

South Africa's red meat abattoir industry is a key driver of economic growth, as it contributes to value addition, job creation and exports. However, increasing water scarcity, combined with rising costs of energy and fuel, is threatening the competitiveness and sustainability of the sector. It has been estimated that South Africa's red meat production sub-sector takes up to 10% of the total water consumption and slightly less of the energy consumption in the agricultural processing space (excluding pulp and paper). The sector possesses significant potential to reduce the use of water and other resources, which would improve its cost base and environmental footprint, and increase the competitiveness and sustainability of abattoirs and integrated operators, as well as enhance their export potential.

The IFC, in partnership with the Swiss State Secretariat for Economic Affairs (SECO), the Netherlands and the RMAA conducted a resource efficiency benchmarking study of 21 red meat abattoirs of various sizes, species and geographical locations in South Africa to assess gaps in the efficient use of resources with a focus on water, and identify areas for improvements in performance and sustainability. The benchmarking identified the **potential to reduce water consumption by up to 28 percent in the industry**, resulting in **national savings of up to 1.25 million cubic meters**. This water consumption saving is dependent on improved operational practices, equipment upgrades and policy reviews with cognisance of the challenges in the provision safe red meat production.

The objective of this document is to highlight some South African regulations applicable to red meat abattoirs which could be reviewed by the relevant authorities for amendment to promote water

efficiency and align with international best practices, according to the findings for the resource efficiency benchmarking study.

3 The resource efficiency benchmarking study for red meat abattoirs in South Africa

The red meat industry is a key sub-sector of the agri-processing sector, with 423 abattoirs processing a total of 5.1 million slaughter units (SUs) in 2019. The red meat abattoir industry is also a major water user in the agri-processing sector, utilising an estimated 4.5 million cubic metres of water per year. In 2020, the resource efficiency benchmarking study, conducted by IFC in partnership with RMAA, surveyed a sample of 21 abattoirs in South Africa of various sizes, species and geographical locations, and major water and energy saving opportunities were identified. It was determined that there is a potential to reduce water consumption by up to 28% in the industry, resulting in national savings of up to 1.25 million cubic metres and R37 million per annum. Similarly, there is a potential to reduce energy consumption by up to 24% resulting in national savings of up to 92,000 MWh and R105 million per annum. Two publications have been produced detailing the findings of the study namely: the *[“Benchmarking Study: Resource Efficiency in Red Meat Abattoirs in South Africa”](#)* and a *[“Practical Guide for Improving Resource Efficiency in Red Meat Abattoirs in South Africa”](#)*. In addition, a self-assessment tool has been developed to allow for any abattoir to compare their resource efficiency performance to international and South African benchmarks.

A number of opportunities for improved water efficiency, based on international best practices, were identified during the study. Two of these opportunities require a revision of the red meat regulations before they can be implemented. These opportunities are detailed below:

Optimise knife and hook sanitation systems

All of the abattoirs surveyed utilised overflow hot water systems for knife sterilisation. Invariably, these are boosted to the required temperature with electrical elements at the point of use, or steam is used to maintain the temperature. Conventional hot water overflow knife sterilisation systems and hook spray systems use significant amounts of energy and water. The aim of the process is to effectively sanitise the equipment by exposing it to elevated temperatures for a set period.

New systems of sanitation, including dry (UV sterilisation) and on-demand “spray” systems significantly reduce the amount of hot water/steam used while improving the cleaning and sanitation efficacy.

The cost of the water used at this step would vary between R50-R140/kl depending on the heating system and the cost of water. A knife steriliser would use between 2-5 l/min which equates to 250-600 kl/annum. Each knife steriliser therefore costs in the vicinity of R12 500-R35 000/annum to operate, depending on the flow rate setting, the cost of water and the cost of energy.

This cost could be reduced by over 80% through implementing spray sterilisers, low flow insulated sterilisers or alternate technologies. There would be a two- to three- year payback period on implementing alternative sanitation systems for knife and hook sterilisers.

Per the regulations detailed in the following section, **any method of sterilization, other than the overflow system, must be approved by the Provincial Executive Officer (PEO).**

Water re-use opportunities

In Australia, water utilisation of red meat abattoirs fell by 30% over 16 years. A significant impact on reduced water consumption was likely provided by an increased use of reused/recycled water. However, in South Africa, current regulations do not allow for the re-use of water.

Some wastewater streams are relatively clean and may be used elsewhere in the plant for activities that do not require high quality water. The key to water reuse is the ability to segregate suitable wastewater streams from the main wastewater drainage system, and to ensure that the reused water is bacteria free.

There are a number of water re-use opportunities for South African abattoirs. Two particular opportunities include: i) **recover evaporative condenser bleed and use for cleaning in the lairages;** and ii) **reuse steriliser water in the scald tanks in abattoirs processing pigs.** The regulations below should be revised to allow for the safe reuse of water to align with international best practices.

4 A summary of red meat regulations pertaining to resource efficiency

The following regulations refer to aspects directly or indirectly relating to resource utilisation. Interventions are at the same time required to ensure and enhance meat safety:

1. Structural requirements in terms of the grade of abattoir whereby additional rooms is required or separation of function. Chilling capacity for at least the daily throughput. Separate Ante chambers for clean and dirty functions. On site change rooms, shower and toilet facilities with separation of facilities between clean and dirty functions at high throughput facilities. Toilets to be provided with hand wash-basins, soap dispensers and hand drying facilities. Facilities for the sanitation of livestock vehicles and meat transport facilities. Separation of chilling facilities of carcasses /red offal and rough offal. Maintenance of environmental temperature below 12°C for cutting wrapping, packing and dispatch. Extraction facilities for vapour control.
2. The provision of sterilizers with water at 82°C at working stations or in the case of cutting plants a valet system where handheld equipment are collected on a regular basis and sterilized in a central facility. An emergency sterilizer is still required. Sterilizers must have an inlet, overflow and outlet and **must drain through a down pipe directly into a closed drainage system or into an open channel, but such drainage water may not flow over the floor across areas where traffic occurs. Provision is made for the approval of any other method of sterilization by the Provincial Executive Officer (PEO).**
3. Hand wash basins within three meters of work stations must be provided with an inlet, overflow and outlet and **must drain through a down pipe directly into a closed drainage system or into an open channel, but such drainage water may not flow over the floor across areas where traffic occurs.**
4. Apron-on wash-cabinets must be installed near work stations and be constructed so as to contain splashing from personnel washing their aprons while wearing it and **must drain directly into a drainage system.**
5. Provision for an enclosed drainage system for the disposal of effluent.
6. Ventilation of all working areas with lighting of at least 220 lux in all working areas and 540 lux where meat is inspected.
7. Lairages must be supplied with water troughs and with cold water sprayers for pigs.

8. Water points must be provided for cold water and water at not less than 40°C for sanitizing; Water at 40°C for washing of hands.
9. **The washing of offal with clean running water.**
10. A separate chilling facility for cartoned and cleaned rough offal.
11. Refrigeration with capability to provide uninterrupted chilling to core temperature of 7°C before dispatching of meat, **defrost mechanisms to prevent the build-up of ice and drainage connections from drip trays to ground level outside or directly into the drainage system.**
12. Prohibition of cartoned products in chillers with exposed meat.
13. A prohibition for the transport of cartoned products in a vehicle with exposed meat; waterproof containers for offal may however be part of a consignment of chilled meat.
14. Sanitation programmes with frequency of cleaning, step by step cleaning procedure for each area.
15. The provision of clean protective clothing daily with these clothes to be changed if it becomes contaminated.
16. Personnel must shower in before assuming duties.
17. The final washing of carcasses with running water under moderate pressure to remove bone chips from the split sternum and vertebrae and to wash of blood after meat inspection.
18. Condemned material must be disposed by a) total incineration, b) denaturing and burial, or c) processing at a registered sterilizing plant.

5 Interpretation of regulations and proposed changes

Alternative methods of sterilisation

Current regulations provide an opportunity to consider and approve other methods of sterilisation (see item 2 in Section 4). **The following methods of sterilisation should be considered**

- i. **Interlocked / on-demand spray sterilisation; and**
- ii. **UV sterilisation.**

Water reuse

It is recommended that a provision be made for the outflow of sterilizers and hand wash basins to be used for continuous cleaning in low traffic areas. Although this is provided in the regulations, plant design often dictate that this water must flow directly into the closed drainage system. During the evaluation of abattoir plans or onsite inspections, the reuse of this water for continuous cleaning should be encouraged to reduce water use.

The current regulations require SANS 241 standards for all water used in the abattoir. **Water reuse opportunities from sterilisers and handwash basins, as well as evaporative condensers should be considered for the wash down of lairages and trucks, and pig scalding tanks.**

Other water saving opportunities

Optimisation of continuous cleaning systems with restriction orifices and shut off valves should be recommended as part of routine audits.

6 Potential impact

Based on findings of the study, the use of **an alternative steriliser method**, such as on-demand spray or UV sterilisers could result in savings of up to 4% of the total water consumption of the red meat abattoir industry, therefore resulting in **water savings of up to 200,000 cubic meters per annum and cost savings of R10 million per annum**. This would make a significant contribution to the water scarcity challenge in South Africa and assist the industry to become more sustainable and competitive.

In addition, there is an opportunity for the new steriliser equipment to be manufactured locally, therefore creating job opportunities and contributing to the economy.

The study was not able to estimate the potential impact of water reuse, but based on the trends of comparable countries, such as Australia, the impact will be significant.

7 Conclusion

The findings of the resource efficiency benchmarking study for red meat abattoirs in South Africa show that there is an opportunity to review the current red meat regulations for potential amendment to align with international best practices and promote water efficiency. **The study identified particular opportunities related to sterilisation methods and water reuse. A review of these regulations would unlock significant water and cost saving opportunities and therefore enable an improved competitiveness and sustainability of the red meat abattoir sector.**