

# Remote Operations – Shadow Robot (Stage 1)

Full Project Title

Project Code  
2021-1158

Prepared by  
Mimeo Industrial Ltd

Date Submitted  
21/01/2022

**Disclaimer** The information contained within this publication has been prepared by a third party commissioned by Australian Meat Processor Corporation Ltd (AMPC). It does not necessarily reflect the opinion or position of AMPC. Care is taken to ensure the accuracy of the information contained in this publication. However, AMPC cannot accept responsibility for the accuracy or completeness of the information or opinions contained in this publication, nor does it endorse or adopt the information contained in this report.

No part of this work may be reproduced, copied, published, communicated or adapted in any form or by any means (electronic or otherwise) without the express written permission of Australian Meat Processor Corporation Ltd. All rights are expressly reserved. Requests for further authorisation should be directed to the Executive Chairman, AMPC, Suite 2, Level 6, 99 Walker Street North Sydney NSW.

## Project Description

This project is a proof-of-concept example of robots being used to replace personnel in bandsaw meat cutting, where the robot is controlled by a remote operator. The work has been undertaken in response to a call from AMPC for a staged programme of development work on Remote Operations/Shadow Robots. This work covered Demonstrating the Concept (Stage 1).

## Project Content

The objectives of the work were to design, build, test, evaluate and demonstrate a system working.

The system included the following equipment:

- A robot, controller and robot control software
- Bandsaw
- Cameras
- Object Tracking Table
- Safety equipment
- Laser pointer for remote operator guidance.
- Control Software/interfaces
- User Interface
- A simple clamp to hold the meat

The system set up is a robot situated adjacent to the bandsaw and the meat to be cut is held by the robot, see Figure 1. The position of the robot is controlled by an operator who is situated at an operator's workspace out of reach of the robot and bandsaw. The operator moves a tracked object within the operator's workspace. The robot end-effector "shadows" the motion of the tracked object in real-time such that the operator can manipulate the meat to be cut by the bandsaw. Other features include:

- scaling the motion of the tracked object
- constraining motion during cutting and
- selecting a width/thickness of the cut.



**Figure 1** – Photo of the set-up including the safety fencing within which sits the robot and bandsaw.

## Project Outcome

Proof of concept (Stage 1) was successfully completed. Early results show that:

- accuracy of cutting in the order of a few millimeters is easily obtained, and
- speed of cutting is controlled by the operator but is reasonable for the stage of development e.g a rack cut in under a minute.

This work shows the application of a shadow-robot concept to cutting meat on a bandsaw is workable.

A provisional patent has been filed for this concept.

## Benefit for Industry

This proof of concept has shown there is good potential for using remote operations and shadow robots for cutting with a bandsaw.

The benefits of this approach include:

- Removing staff from dangerous operations, via Hands-Off processing, and
- Improving Safety and Wellbeing, via reducing the high-risk nature of processing operations.

More specifically, further development will enable operational staff to undertake bandsaw cutting operations to remote locations eg a control room.

It is recommended that this work continues to Stage 2 to improve the system further.