AMPC

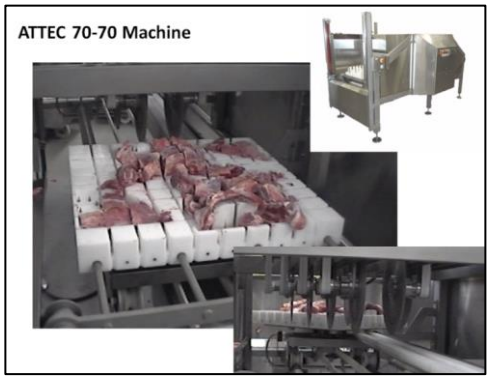
SNAPSHOT

Caprine and Ovine "cubing" characterisation and automation feasibility

Project Report Reference: 2016.1001 **Date: 25 September 2016**

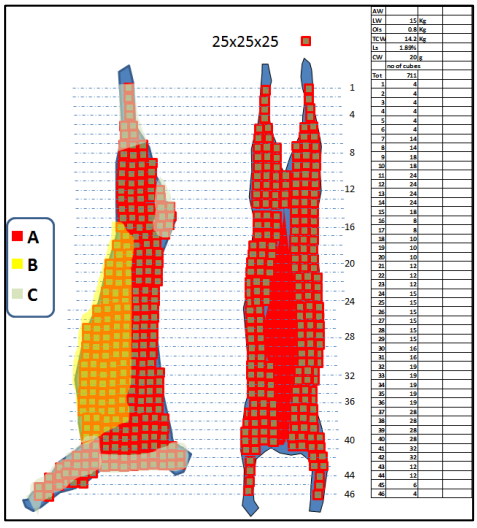
This project has considered the feasibility of automation to meet the requirements of carcass cutting into cubes, assessing also current commercial solutions.

The 70-70 machine from ATTEC Danmark A/S is the only solution reported for fresh meat cubing. "Cube" sizes are approximate, given the natural profile and variability of carcasses.



In Australia, primal cut meat is generally compacted into frozen blocks and cut into "cubes" for bulk packaging or in bags of fixed weight for export. Tests conducted indicate that cutting frozen by band-saw results in over 3 times the loss compared to cutting fresh.

The cubing process is influenced by the variability of the carcass shape, size and weight, which determine the number of whole cubes that may be extracted against a given specification. The cutting scheme and control in the handling processes are more dominant factors.



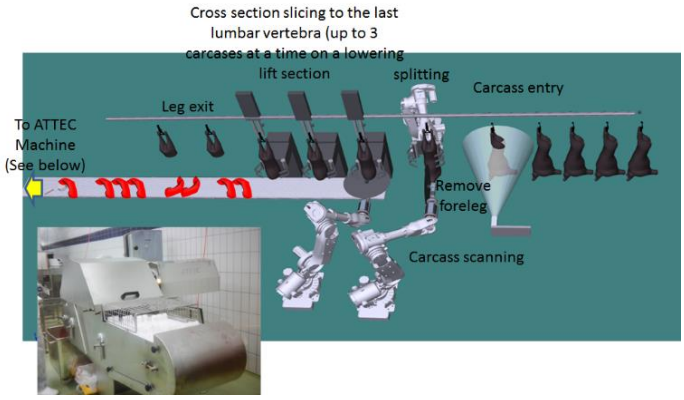
Against a given target cube size and quality, there exists an optimum cutting scheme for extracting the highest number of conforming cubes. In the range 25-25-25 mm and 50-50-50 mm, the evaluations suggest loses of 1.89% and 0.9% respectively from the process when cubing fresh meat by band-saw. These are

mapped into specific losses for goat, lamb and mutton carcasses in the respective weight ranges.

Efficiency performance has been examined using a theoretical approach, but using measured data from practical time and motion of band-saws operations and associated handling. The process of production is based on current known approaches to cubing and options for minimum labour lines of production pointing to the key developments.

Automation solutions have been evaluated and a range of currently adopted techniques are considered suitable, but require integration in a form that allows flexibility and throughput capacities that meet processor expectations. During the course of this study, it has become apparent that a single standalone machine for performing cubing of a whole carcass is not a practical proposition. Furthermore, using multiple knife blades adjacent to each other poses significant complications for cutting primal pieces with hard bones such as those in legs or shanks.

The feasibility of automation to meet the requirements of carcass cutting into cubes has been revealed to be practical using a systems approach. A systems drawing of a solution with estimated costs resulting from initial tendering or consultation with specific suppliers has been reached. The approach provides a flexible solution that also supports primal cutting of whole carcasses as it is based on a robotic system already developed for ovine cutting.



The solution for automation proposed is based on the Scott Technology goat 6 way cutting system with adaptations to produce slices from the carcass. The slices may be cut into cubes using the ATTEC 50-50 machine, which, despite its limitations for breaking leg and shank section, would cube rib sections from the main carcass once presented in strips as generated by the robotic system.

The final approach to the solution recommends the separation of the foreleg, leaving the main carcass to be cubed from the neck or breast of the carcass to the top of the last lumbar vertebra, with the carcass hanging from the legs. The remaining long leg and the forelegs are not to be cubed as this will generated a high proportion of diced meat rather than bone in cubes, especially with smaller size cubes (25 mm). The forelegs and hind legs may be retailed separately as primal pieces or main joint for

higher price than cubes.

The overall impact of automation has been assessed and benefits quantified, including assessment of investment opportunity and returns against different production line design scenarios. It is estimated that automation can potentially contribute to a A$7 per carcass saving, relating to losses from band-saws and labour. In a 300 carcasses per hour operations labour savings approaching 15 heads is estimated combined with the elimination of operator contact with band-saws. Significant quality and presentation benefits may also be expected with the use of knife-blades for a large number of cuts.

Evaluation of the technologies such as band-saws and knife blades (or a combination) as possible technologies for the cubing process as well as automation solutions has been made. For cubing, band-saws are generally used with frozen meat leading to losses greater than 7%. Cutting unfrozen into cubes is not a current practice in the Australian meat industry, but use of knife blades can reduce such losses by, at least, a factor of 3.6.

EVALUATION OF CUTTING FROZEN 17th March 2016	All in Kg ±0.1
16.9	Kg carcass weight in frozen form
15.7	Kg net weight of cubes after band-saws
1.2	Kg loss in bandsaw dust that did not end in finished bags
7.6%	**loss into band-saw dust (X)**
100	carcasses per hour
100	$/carcass
5	days/wk
48	wks/year
7.5	hours per shift
1,800	total hours
180,000	carcasses/year
6%	yield saving estimate based on latest evaluation X/3.6
9,936	equivalent carcass savings in repect of yield improvement
993,631	a) AU$/year possible gain in yield
4	people saving based on observations of current practice
50,000	per person/year
200,000	b) AU$ labour saving opportunity
1,193,631	**Total potential saving (a) +(b)**
7	**AU$/carcass**

Significant reduction in the use of band-saws, typically 6 may be eliminated, will result in better work environment and reduced insurance payments. The main benefits would be in labour saving and reduction of yield loss in the process by avoiding band-saw dust, which is equivalent to 6% of weight of carcass sections cut into cubes. The initial tendering places the cost of the proposed system at A$1.5m with potential return on investment less than 18 months.