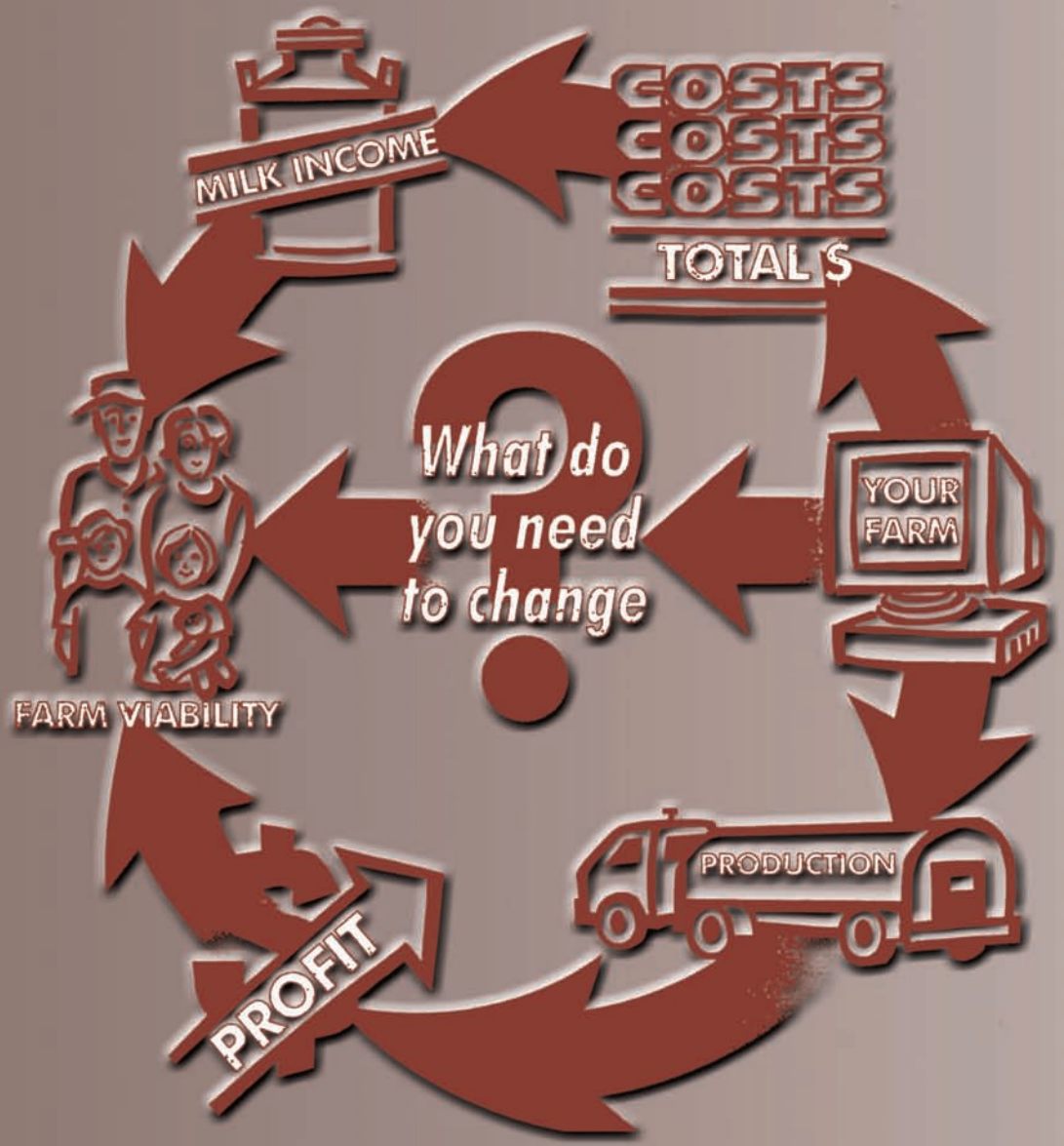
IMPROVING SHED MANAGEMENT

for profits



Assisting farmers to identify areas of shed management which will help improve profits

DAIRY CHECK

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Foreword

Change is occurring at a rapid rate in the NSW dairy industry due to the cost-price squeeze associated with reduced milk prices and increasing costs of production.

Many farmers wishing to stay in the industry are at the crossroads, having to make major decisions on ways to improve farm productivity and profitability.

It is difficult to speculate on future milk prices but the cost of production and living expenses suggest that we will need to continually challenge existing herd sizes and profit margins per hectare and per farm.

Lower milk prices suggest that gradual change will not be the complete answer and productivity gains will have to be made at even faster rates and greater amounts than in the past.

It has been estimated that we will have a shrinking industry when it comes to the number of farms, however, in terms of the production per farm and the adoption of new technology, dairying in NSW will continue to be a growth industry.

A common factor will be the need to increase the effectiveness of existing operations to reduce costs then consider ways to graze and milk larger herds to improve total farm income. This will involve close examination of the key drivers of profit ie herd, shed, feed, labour and farm management.

Alex Ashwood
DairyCHECK Coordinator.

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WHAT IS DAIRYCHECK?

DairyCHECK is about farmers selecting the most appropriate technology and farm management to improve the overall profitability of their farm.

DairyCHECK is based on a series of integrated technical packages and activities (eg.Tutorials and workshops) to help farmers make better decisions during a period of rapid changes.

The project comprises of three stages:

Stage 1 – Farm Management Audit – using a "Checklist" to determine management opportunities for your farm by:

- Calculating the impact of deregulation on farm income
- Knowing the strengths and opportunities of your farm
- Identifying financial and physical key performance indicators
- Examining ways to improve profits

Stage 2 – Farm Business Management – using various tools and packages to determine the best ways to optimise the use of resources by:

- Understanding the financial and physical performance of your farm
- Identifying your goals and needs
- Considering ways to be profitable
- Analysing farm profits and performance

Stage 3 – Profitable Production System - using the most up-to-date knowledge and skills to develop and introduce new technology and different production systems by:

- Examining different production scenarios
- Identifying and analysing cost effective technology
- Planning the implementation of different systems
- Analysing future options and alternatives to improve profits.

INTRODUCTION

The inability of many existing dairy sheds to satisfactorily milk more cows is a major stumbling block to herd expansion and improved profitability. Many existing sheds with their current herd size already consume too much labour, so herd expansion is not an option. The decision to continue milking in your existing shed, upgrade the existing shed, or build a new shed requires careful planning.

The three options if the herd is increased are:

(a) increase labour requirements for milking in the existing shed

(b) capital investment into a labour efficient upgraded or new shed

(c) a combination of both (a) and (b)

The final decision will be a compromise between an expensive labour efficient shed, and a cheap high labour shed. To help with the decision making process, a partial budget should be used to calculate the costs and benefits of any planned changes (see Appendix iii).

This Dairy Shed Management manual will step you through the decision making process of designing the most appropriate dairy shed (new, or upgrade of your existing shed) to meet your current and future needs. Only herringbone dairy sheds are covered in this manual as they represent most of the new and converted dairies being built in NSW. Generally rotary dairies are not considered a viable alternative for dairies milking less than 300 cows. However, if you feel a rotary dairy is an option that should be considered, most of the information in this manual is applicable.

The manual covers three (3) important areas of the milking shed:-

1 The design, size, configuration and layout of the milking shed;

2 milking machine selection;

3 dairy effluent management.

Each section lists the most common alternatives available to you for each component of the dairy shed with a summary of the good and bad points for each alternative. The list is by no means exhaustive, but does cover the majority of options available to you. If more information is required consult the further readings list at the end of each section.

At the completion of the manual, you should have a clear picture of the most appropriate dairy shed to meet your needs, as well as the steps required to get the shed from the design phase to completion.

GUIDE TO THE SHED MANAGEMENT MANUAL

This booklet looks at shed management to improve the profitability of your farm as well as ensuring your environment responsibility.

STEP ONE — **Identify the strengths, weaknesses and opportunities of your existing milk shed.**

STEP TWO — **A step by step process for designing the most appropriate herringbone shed to meet your current and future needs.**

STEP THREE — **A step by step process for selecting the most suitable milking machines to meet your needs and budget.**

STEP FOUR — **An audit of your existing dairy effluent to identify if your system meets industry guidelines and Government requirements.**

STEP FIVE — **A step by step process to design and manage the most appropriate dairy effluent system for your dairy enterprise.**

The DairyCHECK Shed Management manual describes some key management areas and key performance indicators to help you achieve higher profits and farm income through better milking shed design.

The booklet will hopefully be an introduction to other management packages, available through your participation in DairyCHECK.

This self-help booklet on Shed Management to improve profits was compiled by:

Tony Dowman – NSW Agriculture, Kempsey

SECTION 1

Audit of your Existing Shed Management

INTRODUCTION

The NSW dairy industry has seen continual change to milking equipment and shed design to meet labour productivity goals and accommodate larger herds.

Nevertheless, with recent increases in herd sizes (10% increase per year), many farmers have found themselves in a situation where increasing labour units are being used to substitute for capital investment in labour saving technologies and/ or modifications to sheds.

A startling statistic is that on over 40% of dairy farms, the milk harvesting process consumes more than 50% of total labour available. Studies show that the time spent in milking operations (movement of cows, milking, cleaning) ranges from three to eight hours per day. Average sized herds (100-150 cows) can occupy 5 ½ - 6 hours/day for milk harvesting. While milking is an essential task, it should not consume excessive labour or reduce grazing time for the herd.

Developing management techniques and introducing equipment to improve shed efficiency will be a major challenge to farm growth and productivity. The risk of over-capitalising the milking shed to minimise milking times and labour requirements must be compared to the other extreme of using a low cost low throughput shed which requires more labour and longer milking times.

The benefits of efficient milking sheds for pasture grazed herds are:

lower labour requirements, resulting in more available time for other on-farm activities, or leisure; or less employed labour,

more grazing time for the herd,

reduced effluent which has to be managed.

The benefits for feed-lot dairies is less defined as lost grazing time is not an issue when the herd is split into groups and the feed-lot is adjacent to the milking area. Effluent management is not a problem as the system has been designed to handle all the daily effluent produced. Long milking times in low cost sheds is an option to be considered for feed-lots.

As external forces (eg. the need to become more efficient as a result of deregulation) place increasing pressures on dairy farmers, shed productivity will continue to figure high on the agenda.

Key performance indicators can be used to determine where improvements can be made to increase shed efficiency and farm performance.

SHED MANAGEMENT – KEY PERFORMANCE INDICATORS (KPI)

Can your time and money be spent more profitably working on the farm by reducing milking times for yourself or employed labour?

The following performance indicators can be used to show how many cows are being milked in a certain time, and estimates of shed productivity to gauge what improvements need to be made.

- ***Cups on time (hours)***
  Time spent from 1st cow entering bails to last cow leaving bails

  = ... hours

- ***Cows/cluster/hour***
  Number of cows milked ÷ number of clusters ÷ cups on time (hours)

  ……. ÷ ……..... ÷ ……. = ...cows

- ***Clusters/operator***
  Number of clusters ÷ number of operators milking

  ……..... ÷ ……..…..……..... = ...clusters

- ***Shed time : milking time ratio***
  Total time spent at bails (hours) (preparing, milking and cleaning up) ÷ cups on time (hours)

  ……..... ÷ ……..…..…. = ...:1

- ***Litres/operator/hour***
  Total milk production from 1 milking ÷ number of operators ÷ cups on time (hours)

  ……. ÷ ……..... ÷ …..…..... = ...litres

- ***Cows/operator/hour***
  Number of cows milked ÷ number of operators milking ÷ cups on time (hours)

  ……. ÷ ……. ÷ ……. = ...cows

SHED MANAGEMENT CHECKLIST

The following checklist can be used as guidelines to determine shed productivity and the overall efficiency of milking operations.

Checklist	KPI	My Farm	Action		Things to Consider
			OK (✓)	Investigate (?)	
1 Cups on time (hours)	<2 hours per milking* * ***Unless the decision is made to have long milking time.***				• Wrong size shed for herd size • Is labour cheaper than a new shed? • Less time to do other farm work • Excessive milking times may impact on herd production and labour utilisation • Impact on family relationships
2 Cows per cluster per hour	>5 (walk-through) >8 (swing-over herringbone) >5 (double-up herringbone) >7 (rotary)				• Slow cow preparation • Poor cow flow • Labour saving devices • Over milking • Milk harvesting routine • High production • Shed design • Extent of bail feeding
3 Clusters per operator	>6 (walk-through) >12 (swing over herringbone) >16 (double-up herringbone) >20 (rotary)				• Lack of automation • Labour saving devices • Work routine • Skilled labour • Poor shed design
4 Shed time:	<1.3:1				• No in-place cleaning In-efficient • yard washing
5 Litres per operator per hour	>300 (walk-through) >960 (swing-over herringbone) >800 (double-up herringbone) >1400 (rotary)				• Low producing cows • Cups:operator ratio low • Milk harvesting routine • Shed design • Skilled labour
6 Throughput cows per operator hour	>30 (walk-through) >96 (swing-over herringbone) > 80 (double-up herringbone) >140 (rotary)				• High production cows • Slow cow preparation • Poor cow flow • Not enough clusters per operator • Labour saving devices • Extent of bail feeding

IMPORTANCE OF SHED MANAGEMENT KPI'S

Shed management key performance indicators will allow you to assess how well your milking shed is matched to your herd size, available labour and time, and milking routine. Most sheds are a compromise between the ideal shed and what is affordable.

1. KPI – Cups on time

Most dairy farmers have a limit on how much time they are prepared to spend each day milking cows. This limit needs to be taken into consideration when designing new sheds and is influenced by available labour. A compromise has to be reached between expensive low labour sheds, and cheap labour intensive sheds. Long milking times will reduce grazing time for the herd, unless the herd is split and smaller groups are bought to the shed at staggered intervals. Longer milking times will result in increased labour demands for both milking and herd management, increased amounts of effluent to be managed, and less time available for other farm work or personal time.

2. KPI. – Cows per cluster per hour

Cows per cluster per hour indicates the expected difference between the shed types using similar milking practices. The ratio between the different sheds is more important than the absolute figures when using this KPI to decide the advantages of changing sheds.

3. KPI – Clusters per Operator

Clusters per operator have increased over the years from 3 in old walk-through sheds to 50 in large rotary dairies using automation and one labour unit putting on cups. This KPI does not always measure shed efficiency. Milking efficiency does not improve if there are too many clusters for the operators to handle resulting in over-milking or clusters hanging idle.

4. KPI – Shed time : Milking time ratio

Preparing the shed for milking, and cleaning up afterwards can consume considerable time. New yards should be designed for flood wash, even if the system is not installed straight away. Hose-down areas should use high volume pumps to reduce time. In-place cleaning of machines and vats will further reduce shed time. Stock movement time to and from the dairy needs to be considered as well. Location of the dairy in relation to grazing paddocks, and the use of suitably sized laneways constructed from materials that will not cause lameness will influence shed times.

5. KPI – Litres per Operator per hour

Litres per operator per hour is similar to cows per operator per hour but takes into account reduced through-put caused by high producing herds.

6. KPI – Through-put as cows per operator per hour

Cows per operator per hour is the most common indicator used to measure the performance of the dairy shed as it takes into account the efficiency of the operator to milk cows as well as matching the size of the shed to the available labour and herd performance.

A shed which is poorly designed for cow movement on and off the platforms, too few clusters per operator, excessively long cow preparation times, and high producing herds will reduce the efficiency of the shed. Many sheds add extra unnecessary labour units during milking for company or convenience at the expense of maximising labour efficiency. Labour saving devices (cup removers etc.) can have a dramatic effect on this KPI.

DAIRY CHECK – DAIRY SHED MANAGEMENT

What do you believe the main shed management issues on your farm are?

Write down the issues that may be limiting the performance of your shed.

Using the KPI's and knowledge of your operations, please consider the following questions…..

What are your strengths in Shed Management?

WHAT are your opportunities in Shed Management?

WHAT do you need to change?

WHAT are the most pressing changes?

WHAT will you address first?

WHAT will you achieve by taking action?

SECTION2

Designing your new Herringbone Shed

The construction of a new dairy is a large capital expense and therefore requires careful planning to ensure that the new dairy will meet your future needs.

There is a wide range of variations in design and features that should be considered when planning a new herringbone. The design and configuration most suitable to your needs will depend upon many factors including cow numbers, labour availability, budget, and personal preferences. It is recommended to make provision for expansion of the herringbone shed in the original design to cater for future increases in cow numbers.

The following questions will help you decide the most appropriate milking shed for your farm.

1 How many cows are you milking today? ☐ Cows

2 How many cows do you plan to milk in 5 years time? ☐ Cows

3 How many operators do you intend to use to milk the herd? ☐ People

- Will the available labour change in 5 years?

4 What is the maximum length of time at each milking you are aiming for-

a) Milking the cows only? (ie. cups on time) ☐ hours

b) Total time at shed (setting up + milking + cleaning up)? ☐ hours

5 Do you want to make allowances in the design of the dairy for future increase in herd size?

☐ YES ☐ NO

6 Do you want swing-over or double-up?

☐ swing over

- high cow throughput per cluster per hour (up to 9)
- allows for easy future expansion
- cheaper milking machines (less clusters for same throughput)
- longer platforms in relation to the total numbers of clusters
- must use mid or high line milking machines
- slow milking cows hold up the entire shed.

☐ double-up

- shorter platforms in relation to the total number of clusters
- can use high, mid or low line milking machines
- slow cows only hold up one side
- lower cow throughput per cluster per hour (up to 6)

7 The number of cows on each platform?

Determined by herd size, labour availability, amount of automation, maximum cups on time, throughput, and milking machine set-up.

- For a swing-over, number of cows per side =
  herd size ÷ preferred cups on time (hours) ÷ throughput (cows/cluster/hour)

  ……...…… ÷ ……...… ÷ …...…...… = ... cow/side

- For a doule-up, number of cows per side =
  herd size ÷ preferred cups on time (h) ÷ throughput (cows/cluster/hour) ÷ 2

  ……. ÷ ……...…… ÷ ……...… ÷ *2* = ... cow/side

A check needs to be made on the proposed shed size to ensure that the available labour and maximum work load (clusters per labour unit) are compatible to maintain maximum milking efficiency of the shed.

- Compare your calculated "cows on each platform" figure to:
  For Swing-over – *available labour X max. clusters per labour unit.*

  ..... x ..... = ...

  For Double-up – *available labour X max. clusters per labour unit* ÷ 2

  ..... x ..... ÷ 2 = ...

The answer should be similar to the figure you calculated above for the number of cows on each platform. If the difference is greater then 3, adjustments need to be made to "available labour", "preferred milking times", and/or "clusters per labour unit" to maintain maximum milking efficiency of the shed. Having more clusters than the operators can handle is inefficient.

- As a guide, if no other information is available use:

Preferred milking time	=	2 hours per milking
Throughput	=	9 cows/cluster/hour for a swing-over 6 cows/cluster/hour for a double-up
Clusters per labour unit	=	14 (range 10 - 24 depending upon milk yield, degree of automation, milking routine, operators skill, shed design).

8 The angle the cows stand?

☐ 45 degree

- easier for the cows to get used to
- more difficult for the cows to eat their neighbours feed
- allows for future expansion to 80 degree
- platforms 50% longer than an 80 ° design for the same number of clusters

☐ 80-90 degree

- shorter shed
- faster milking
- more suited to larger sheds
- cows move off the platform faster
- wider shed
- requires some form of cow restraint if feeding in the bails
- takes longer for the cows to learn to stand at the correct angle

☐ other ⇨ ……..... degree

9 Cow restraints in a 80–90 º herringbone? (required if feeding during milking)

☐ feed trough dividers

- cheap
- not very effective

☐ head stalls

- reasonable cost
- effective
- cows need to be "trained"

☐ mechanical stall gates

- effective
- less cow training required
- expensive

☐ other ⇨ *(describe)*……..

10 Exit type?

☐ conventional

- able to draft cows as they leave the shed
- both platforms can exit via the same route
- slower unloading of platforms reducing throughput

☐ rapid exit

- fast unloading of platforms increasing throughput
- best suited to larger sheds
- requires extra space and concrete at both sides of the bails
- difficult to draft cows after milking
- cows exit the shed from two points which requires extra laneways.

11 A walkway in front of the cows heads?

☐ NO ☐ YES ⇨how wide? ……...mm

- allows access to the cows heads during milking
- easier access to the feeders for servicing
- easier to clean walls
- 600 – 800mm typical
- makes building wider and more expensive

12 Width of pit (nib to nib)?

……mm

- Swing- over – minimum = 1500 mm
  – maximum = 1700 mm unless a trolley track system for the rubberware is installed.
- Double-up – minimum = 1700 mm
  – maximum = unlimited

13 Depth of pit (cow platform to pit floor)?

……mm

- determined by height of operators. If too shallow operators will have to stoop to milk; if too deep the operator will have to stretch to put cups on, and water will run down operators arms when washing cows. Cows teats should be about 100mm above operator's waist height. Standard depth 850mm. Range 750 to 950 mm.

14 Platform overhang?

……mm

- allows operators to stand close to cows
- protects operators from bumping into low-line milking machines
- overhang requirements vary for different brands of milking machines
- 200 – 450mm typical overhang

15 Cow exit?

☐ exit laneway to return cows to behind the holding yard backing gate

- allows the herd to leave the bails via the entry laneway
- allows the herd to be held in the main holding yard after milking
- reduces potential effluent management problems at the cow exit point
- allows easy drafting
- extra expense
- more concrete to clean
- cows stopping in the laneway can hold up following cows
- cows have to turn at least two 90° corners slowing cow flow

☐ straight out the front

- best design for cow flow
- reduces weather protection for the operators
- cow drafting facilities limited
- extra laneways required
- potential extra mud/bog/effluent problem
- not possible if milk room on the end

☐ out the side

- possible to use either or both sides
- allows good weather protection for operators
- extra laneways required
- potential extra mud/bog/effluent problem
- cow flow slowed because of turning

☐ other …….....……

16 Exit gates?

☐ pendulum

- excellent cow control
- easily operated anywhere along pit
- easy to use
- expensive

☐ lift up

- adequate cow control
- cheap
- can be set up to operate anywhere along pit but not convenient to use
- can be noisy

☐ hinged

- cheap
- can be set up to open anywhere along pit
- self closing a possible option.
- poor cow control

☐ other …….

17 Entry gates?

☐ pendulum

- excellent cow control
- can be operated anywhere along pit
- expensive
- cannot alter platform length

☐ lift-up

- good cow control
- some types can alter platform length
- easy to use
- some are expensive

☐ hinged

- cheap
- can alter platform length
- poor cow control
- more difficult to use if hinged from feeder side of platform

☐ chain

- very cheap
- can alter platform length
- poor cow control

☐ none

- best suited to 80 degree herringbones
- no cow control
- requires a good exit gate for cow control

☐ other …….....…….

18 Pipe-work in a 45 degree herringbone?

a) Breast rail

☐ zig zig

- allows better location of feed boxes
- more expensive
- difficult to make adjustable and keep the angles correct
- not necessary for cow control

☐ straight

- cheaper
- easy to make adjustable

b) Breech rail

☐ zig zag

- locates the cow in the correct position in relation to the milking machines
- better cow control
- more expensive
- no allowance for varying cow sizes

☐ straight

- cheap
- more suitable for mixed herd sizes
- able to vary the number of cows on the platform if a continuous feed trough is used

19 Nib required?

☐ yes

- reduces wash-down water entering pit
- allows cows to locate edge of pit
- may incorporate leg rope tie-off facility
- reduces dung and urine splashing

☐ no

- saves building expense
- require an alternative leg rope tie-off point to be fitted
- more wash-down water, dung and urine will enter the pit
- cow's leg can slip over edge into the pit

20 Nib Construction Material?

☐ Steel

- allows the cows to stand at the pit edge
- can form part of the pit overhang concrete form work
- can incorporate leg rope tie-off points
- requires fabricating to prevent accidental hoof damage
- needs to be galvanised or constructed from stainless steel
- expensive

☐ concrete

- cheaper
- forces cows to stand further away from the pit
- dung and urine splashes off top edge into pit
- no leg rope tie-off point

21 Splash guards?

☐ yes

- reduces splash of dung and urine onto operators (potential spread of diseases)
- pit stays cleaner.
- most suitable to an 80 degree sheds
- more expense
- difficult to identify cows if the guard is opaque
- more difficult to move cows on and off platforms

☐ no

- good cow visibility and access
- exposes operators to dung and urine splash (potential spread of disease)

22 Splash guard material?

☐ opaque - galvanised sheet steel or stainless steel

- durable
- operator unable to see rear of cow

☐ transparent – perspex, poly carbonate, etc

- able to see rear of cows
- expensive
- scratches and dis-colours with age
- perspex may crack if excessively flexed

23 Slope of milking area?

- often determined by slope of building site

☐ towards holding yard

- allows effluent to be collected at one point

☐ away from holding yard

- effluent collected at 2 points requiring transfer pump or pipe

24 Location of the bulk milk vat?

☐ in milk room

- older vats must be located in the milk room

☐ outside

- reduced building costs
- only new sealed and totally insulated vats can be outside with appropriate weather protection for the tanker driver.

25 Location of the milk-room in relation to the milking area?

☐ at the exit end of pit

- building longer and narrower
- cows must turn to exit building

☐ to the side

- building shorter and wider
- cows can exit without turning

26 The size of the milk room ?

☐ ……..…mm X …….mm

- allow 450 mm clearance between the vat and walls, other vats and fixtures
- allow for up-grading to a larger vat if milk storage capacity will be a problem in the future.

27 Extra enclosed rooms?

- it is cheaper to include these facilities in the original building, then add on later.

☐ NO ☐ YES ⇨ ☐ wash room

☐ office

☐ store room

☐ machine room

☐ toilet

☐ staff facilities

☐ other .....……

28 Extra facilities required?

- allowing for these facilities under the one roof or adjacent to the milking area will improve conditions for stock handling.

☐ drafting

☐ holding pens

☐ crush

☐ race

☐ loading ramp

☐ hospital area

☐ other …….....….

29 Shed Construction?

☐ purpose built

- choice of building materials
- sized exactly to what is required
- limited use if no longer dairying
- not re-locatable
- possibly more expensive

☐ steel shed

- choice of “off the shelf” or custom sized
- may be cheaper
- can be self erected
- often larger then what is required
- re-locatable
- can be a useful farm shed if no longer dairying

30 Roof profile?

☐ flat

- maybe cheaper
- easier to suspend bail pipe work from if correctly designed to do so
- hotter

☐ pitched

- cooler
- more difficult to suspend bail pipe-work from

31 Holding yard size?

☐ ……..cows

- allow minimum 1.5 square metres per Friesian cow & 1.2 per Jersey cow

32 Holding yard shape?

☐ round

- easy to fit backing gate
- easy to direct milked cows back into holding yard
- cows can exit via entry laneway
- minimum fencing to achieve required holding capacity
- difficult to enlarge
- position of entry gate crucial to cow flow
- cannot flood wash successfully

☐ rectangular

- easy to enlarge
- easy to flood wash
- solid backing gates are more expensive
- require exit laneway the length of the yard to direct milked cows back into the yard behind the backing gate

33 Yard entry gate location?

a) rectangular

☐ back

- best for cow flow
- complicates flood wash system

☐ side

- allows flood wash solids trap to be located across end of yard

b) round
describe…….....……..

- should be as far around the circumference from the platforms a possible

34 Yard backing gate?

☐ solid/mechanical

- effective
- expensive for rectangular yards
- heavy

☐ electric curtain ⇨ ☐ lift-up ⇨ ☐ pull-apart

- cheaper
- not completely stock proof
- only suitable for rectangular yards

☐ other…….....……

☐ none

- slows down milking
- more difficult to break in heifers to enter the bails

35 Yard washing?

☐ hose

- cheap
- time consuming

☐ flood ⇨ ☐ from side, OR ☐ risers across yard

- fast
- more expensive
- requires specific criteria for yard design

☐ other ……

36 Cow cooling system?

☐ fans

- can reduce biting fly problems as well
- best results when combined with sprinkler
- moderate cost

☐ yard sprinklers

- cheap
- assists with yard washing
- best cooling results when combined with fans
- can cause sediment problems if cows get too wet

☐ covered yard

- may be part of building, or free standing “sails”
- best results if combined with sprinklers
- expensive

☐ none

- increased cow discomfort when temperature exceeds 28°C affecting milk production

☐ other …….

37 Dairy effluent collection?

☐ drive-in solids trap

- reasonable separation of solids
- suitable for flood wash
- expensive
- front end loader required

☐ sump and pump

- moderate cost
- minimal solids separation
- not suitable for flood wash

☐ drain (open or enclosed)

- cheap - using gravity to transport effluent to a collection/storage system
- correct slope critical to minimise blockages
- no solids separation

38 Feeding during milking required?

☐ YES ☐ NO

39 Feed delivery system?

☐ auger

- can handle a wide range of feeds
- high throughput
- can be noisy
- expensive
- requires additional augers to change direction

☐ cable

- quiet
- cheap
- can turn 90 degree bends
- can lift feed vertically
- will deliver the unused feed back to the silo
- cannot handle fibrous material (eg hay, cotton seed hulls)
- low throughput
- higher maintenance costs
- less reliable

☐ flat chain

- quiet
- cheap
- can turn 90 degree bends
- cannot handle fibrous feeds
- low throughput
- cannot lift feed vertically
- usually requires another feed delivery system to transfer the feed from the silo to the flat chain

☐ centre-less auger

- cheap
- reasonably quiet
- can only turn large radius bends
- eventually wear through the plastic casing
- does not deliver the unused feed back to the silo

40 Feed hopper capacity?

☐ large

- does not require refilling during milking
- solid construction
- able to continue to feed the cows during milking if there is a feed delivery failure
- feed delivery system does not run during milking
- increases on-farm concentrate storage capacity
- expensive
- occupy more space

☐ small

- cheap
- compact
- lightweight (often plastic) construction
- requires refilling during milking
- feed delivery failure will prevent feeding of the cows during milking
- feed delivery system runs continuously during milking

41 Feed bin material?

☐ stainless steel

- non corrosive
- expensive

☐ fibreglass

- non corrosive
- expensive

☐ galvanised steel

- moderate cost
- eventually rust out

☐ plastic

- cheap
- non corrosive
- some not durable

42 Other things to consider

- Location of water outlets
- Location of power outlets
- Location of lights and switches
- Location of compressors, pumps, motors, hot water service
- Location of feed silos
- Location of water troughs
- Entry and exit laneways
- Foot bath
- Automation – eg cow ID, feeding, milk recording, teat spraying, drafting
- Location and size of windows
- Location of doorways
- Preferred construction material
- Ceiling heights
- Tanker access
- Feed truck access
- Preferred holding yard fence construction
- Gate sizes
- Pit access
- Platforms stepped up, or pit stepped down, or combination of both
- Storm water diversion away from effluent system
- Surface finish on concrete
- Weather protection
- Installation of bulk vat into milk room

KEY TRAINING OPPORTUNITIES

Milking machines and their installation should conform to Australian and

Tools, Courses, Packages	Contact
Dairy Shed Design. Milk Harvesting Information Manual	National Milk Harvesting Centre, Warragul - Victoria
Agfacts • Planning an 80^0 Herringbone Milking Shed • How many sets of cups? • Single Versus Doubled-up design – Which is best?	NSW Agriculture (District office)
Building a Better Herringbone Milking Shed – Design & Construction Hints	NSW Agriculture (District office)
Code of Practice for Dairy Buildings (9/1995)	Safe Food Production NSW (ex NSW Dairy Corporation)
Countdown Downunder – Farm Guildelines for Mastitis Control	Local Veterinarian, NSW Agriculture (District office)
Dairy shed building industry	Dairy shed builders
Working Smarter not Harder Labour Productivity Benchmarking Manual	Agriculture Victoria Milk Harvesting Group

SECTION3

Selecting the Most Appropriate Milking Machines

International Standards to ensure the machine's harvest as much milk as possible in the shortest time with minimal cow discomfort and damage to the teat and udder.

The selection of the machines should be made prior to the commencement of modifying or building new sheds. Some machines require extra facilities (such as larger pit overhang, extra space for components, carrier rails, brackets, power outlets, etc) which are easier to incorporate in the original plan, than to alter the dairy after the building is completed.

There are many alternatives and opinions on the milking machines and accessories most suitable for your situation. However, differences in the milking performance between different brands of components of the same specifications are not significant. Brand choice should be made after considering:-

- price
- after sales service
- warranty
- special features of a particular brand
- reliability
- quality of installation
- qualifications of installer (AMMTA)

When comparing prices of different brands:-

- ensure that the quotes are for machines of similar specifications and features.
- check to see if plumbing and electrical costs are included as well as "extras" such as freight.
- using the same brand for all components has advantages regarding warranty and servicing, and should be the preferred option to mixing components.

Footnote:

Standards have been developed and upgraded over the years to describe the minimum specifications for milking machines. The current Standards or specifications in use in Australia are the Australian Milking Machines Trade Association (AMMTA) Construction and Performance Based Standards (February 1997) which are based upon the International Standards Organisation 5707 Standard.

The following check list will help you to assess your own milking machine requirements.

STEP ONE

Question – Why are new milking machines being considered?

- ☐ New Shed
- ☐ Expansion of existing shed
- ☐ Upgrade of existing milking machines

If you have ticked "Upgrade of existing machines", is there a problem with the existing machines in regard to:-

- milking speed (cups on to cups off for individual cows)
- cup slips (due to flooding)
- cup falls (due to flooding)
- udder and teat end health (eg mastitis, high cell counts, teat sores etc)
- excessive foam in receival vessel or vat
- spare parts availability
- reliability
- milk "slugging" in the milk line
- milk quality
- flooding

If not, an up-grade of your machines may not result in a significant improvement in milking machine performance.

Question – Will the proposed shed upgrade or new shed or extensions have the capacity to milk the expected cow numbers in 5 years time?

☐ YES ☐ NO

If you ticked ***"no",*** do you intend to expand the shed again sometime in the future, (within 5 years) it may be financially beneficial to install some larger milking machines components at this up-grade (eg vacuum pump) to meet these future requirements.

STEP TWO

Question – What is your preferred milk and air line location if you are installing double-up machines in a herringbone shed?

☐ high line
- milk and airlines, and attached equipment stays cleaner and dryer
- slightly lowers the machines efficiency because of the required lifting of milk
- pulsators more reliable (not exposed to water)
- more clutter in pit with milk and air rubber-ware

☐ low line
- machines perform at their best
- plant can operate on lower vacuum level
- exterior of milk and air lines and receival vessel get dirty unless splash guards fitted
- pulsators exposed to potential water problems
- extra pit length required for milk receival vessel

☐ mid line
- compromise between high and low line
- splash guards behind cows required
- can get in the way of the operators

STEP THREE

Selecting the most appropriate components can be confusing as there is a choice for most items. Ensure all components meet AMMTA Standards. The components that you have a choice with are:-

a) Vacuum Pump

☐ Oil lubricated vane pump
- cheapest
- requires oil (cost)
- wear out eventually.

☐ Water ring
- expensive
- requires more power to drive pump
- requires water supply
- low maintenance
- long life

☐ Lobe pump
- expensive
- low maintenance
- long life

Select a pump size that is operating between ½ and ¾ of its speed range to generate the required vacuum. Check the kw (power) requirement to drive the pump as an upgrade of the dairy wiring may be required.

b) Air line material

☐ Stainless Steel

☐ Plastic

There is no difference between either material regarding performance. Internal diameters will be different between the two which the technician will allow for. Price and personal preference will determine the final choice.

c) Milk line configuration

☐ Looped *(two smaller diameter lines joined at far end)*

- may wash better
- potentially more stable vacuum
- more expensive
- occupies more space

☐ Dead end *(larger diameter single line)*

- cheaper

Both have similar performance characteristics when sized correctly.

Both require the addition of specific extra components (air surger, butterfly valve etc) to ensure satisfactory cleaning.

d) Milk Pump

☐ Centrifugal

- compact
- high capacity
- cheapest
- two sizes
- can be variable speed
- not self priming, so must be located below milk receival vessel
- not as compatible with plate coolers unless a restrictor installed onto pump outlet, or a variable speed motor used.
- require float control switch

☐ Diaphragm

- 4 sizes
- positive displacement so does not have to be located below milk receival vessel
- compatible with plate coolers
- float switch not required
- expensive
- higher regular maintenance
- may not handle the wash cycle on larger plants
- bulky
- lower capacity

☐ Flexible Impeller

- compact
- high capacity
- positive displacement but usually located below milk receival vessel
- can be variable speed
- 3 sizes
- expensive
- higher maintenance than centrifugal pump
- require float switch

e) <u>Pulsation Systems</u>

i) Pulsator configuration

☐ 2 x 2 (alternate)

- most popular
- less vacuum fluctuations in the claw
- allows possible differential pulsation between front & back quarters
- rubber-ware more expensive

☐ 4 x 0

- cheaper rubber-ware
- may reduce the total number of pulsators required
- higher vacuum fluctuations in the claw
- may induce flooding in low capacity claws by fast milking cows

ii) Pulsator Type

☐ Pneumatic self drive

- some are adjustable
- cheap
- run independent of each other
- no power/wiring required
- higher maintenance
- settings (rate and ratio) can alter with wear

☐ Electronic

☐ Master controller and slaves

- generally the cheapest of the electronics
- settings do not alter
- more suitable to low-line application then electronic independents because of potential water problem
- settings adjustable
- can have differential settings for front and back quarters
- water inside the pulsator can cause problems with the electronics
- all pulsators stop if master controller fails

☐ Independent

- no master controller required
- run independent of each other
- require 12 volt power supply
- less suitable to low line because of potential water problems
- can have differential settings for front & back quarters
- most expensive

☐ Pneumatic Master and Slave

- cheapest
- not common
- require air tubes to transfer the pulse signal
- all pulsators stop if the master pulsator fails

f) Cluster Weight (claw + cups + liners)

☐ heavy (over 2 kg)

- tend to milk out more evenly if cluster poorly aligned to cow position
- better vacuum cut-off in short milk tube if using heavy cups
- more tiring for operator if milking large herds.

☐ light (under 2 kg)

- less tiring for the operators to use
- possible uneven milking of quarters if cluster poorly aligned
- poor vacuum cut-off at the short milk tube.

g) Claws

☐ Conventional size (100 - 200 ml capacity)

- cheapest
- heavy
- possible flooding problems in fast milking cows (over 5 litres/minute) in highline sheds
- more cup slips and falls from less stable vacuum

☐ Larger Capacity (200 - 450 ml)

- generally lighter
- less cup slips and falls from the more stable vacuum
- milk marginally faster
- reduced mastitis transfer between quarters
- larger milk entries and exit
- more expensive
- some people may find more difficult to handle because of larger size

h) Shells

☐ light weight

- keeps the cluster weight down
- may contribute to uneven milking of quarters in swing-over herringbones with wide pits, or poor alignment of machines to cows
- vacuum cut-off at the short milk tube can be a problem

☐ heavy weight

- more even milking
- better vacuum cut-off at the short milk tube
- increases cluster weight

i) Liners

There are a wide range of liners available on the market. Select a liner that meets the following criteria:-

- compatible with your shells regarding
  - sealing top and bottom
  - allow liner to collapse inside shell
  - correct length to allow 5 - 15% stretch of liner to fit shell
- compatible with milk inlet nipple diameter on claw
- effective liner length greater than 140 mm
- bore diameter that keeps cup slip below 4% without causing damage to the teat or excessive milking time
- mouthpiece diameter that does not cause excessive milking times, excessive milk left in the udder, cup crawl, excessive air leaks, or teat damage

Generally if you are happy with the performance of your present liners in regard to cup slips, teat end damage, air leaks, milking times, and complete milking, do not change the specifications of the mouthpiece and bore diameters when choosing new liners.

j) **Milk Filter**

☐ Disposable socks

- cheaper initially but higher operating costs

☐ Re-usable socks

- more expensive initially
- require washing and sterilising after each milking

The size of the filter is determined by milk volumes. There may be a benefit in increasing the filter size if strategic washing of cows is practiced.

There are no other significant choices to be made regarding the other components of the basic milking machine. The size and configuration of your machines will determine the remaining components.

STEP FOUR

Question - Is there any benefit in installing labour saving devices onto the milking machines to:-

- Delete one or more labour units during milking
- Reduce milking times by increasing the number of sets of cups the existing milkers can handle
- Make it easier for the milkers to carry out milking and other related activities
- Reduce over-milking thus improving udder and teat end health
- Improve herd management

There are a number of labour saving devices that can be added to your machines which can make milking easier, reduce milking times, reduce labour requirements, improve milk quality, improve udder and teat health, and improve herd management.

The benefits should be compared to the cost of installing these extra components.

Labour saving devices to be considered are:-

☐ in - place machine cleaning
- saves carrying buckets of water
- can clean more effectively

☐ programmed (automatic) machine cleaning
- saves carrying buckets of water
- can clean more effectively
- has a programmed wash cycle (press the start button and walk away)

☐ in - place vat cleaning
- can clean more effectively (but may require some manual cleaning)

☐ automatic teat cup removers
- fewer operators required
- operators can handle more sets of cups
- prevents over-milking
- better udder and teat health

☐ vacuum reduction/arrest systems

- fewer operators required
- operators can handle more sets of cups
- prevents over-milking
- better udder and teat health
- can re-start milking if cow has 2nd let down
- operator still required to remove cups

☐ electronic milk recording

- accurate
- allows herd recording at every milking
- ideally suited to computerised recording keeping
- can identify abnormal milk
- expensive

☐ electronic feeding

- allows cows to be fed automatically and individually based upon production

☐ electronic cow identification

- allows further automation of electronic recording, electronic feeding and computerised record keeping
- can identify cows in season
- expensive

☐ automatic teat spraying

- saves time
- better teat coverage than careless manual spraying
- requires single file cow exit

☐ automatic drafting

- saves time
- requires electronic cow identification
- requires single file cow exit

Note: *Electronic milk recording, feeding and cow identification may require alteration of the existing machine's specifications and location. If these options are being considered for future installation, ensure the new machines are compatible.*

STEP FIVE

QUESTION Are there plans to up-grade the milk storage and/or cooling system?

☐ YES ☐ NO

If you ticked ***"yes"*** the options are:-

☐ Direct Expansion (conventional vat)

- cheapest to purchase
- occupies the least space
- pre-cooling (plate cooler) usually operates with water
- expensive to run as cannot use off-peak power

☐ Ice Bank

- majority of cooling done by plate cooler operating with ice water
- cheap to run - uses off peak electricity
- lack of maintenance can cause problems
- require a double bank plate cooler or two (2) plate coolers
- expensive to purchase

☐ Glycol Thermal Storage

- cheap to run - uses off peak electricity
- majority of cooling done by plate cooler operating on glycol.
- require a double bank plate cooler or two (2) plate coolers
- expensive
- requires storage of large volume of glycol

☐ Glycol Direct Expansion

- cheaper then glycol thermal storage to purchase
- majority of cooling done by plate cooler operating on glycol
- vat direct expansion only to maintain milk below 4^{o}C
- expensive to run
- require a double bank plate cooler or two (2) plate coolers

Vat capacity required ……..…. litres

STEP SIX

What to do Next

- When you have decided on the most suitable milking machines for your needs, contact the milking machine technicians that can service your area. There are at least 6 different brands of milking machine equipment available in Australia.
- Obtain at least two (preferably three) fixed price quotes for the supply, installation and commissioning of the new machines.
- Make sure the quotes list the inclusions and exclusions in the price. Items such as freight, hot water system, electrical work and plumbing can increase the final price considerably.
- If the power requirement for the new machines is greater or different (3 phase) than your old shed, obtain a price from the power supply company for the upgrade before making any commitments.
- If the machines are being installed in a new or modified shed, make sure the milking machine technician and the shed builder get together prior to commencement so required pipe-work, brackets, services etc. are located in the correct position.
- It is advisable that the milking machine technician is present at the first milking to ensure that the machines are functioning correctly.
- Final payment for the machines should be made after a milking time test has been conducted, and the machines are functioning to their specifications and your satisfaction.

KEY TRAINING OPPORTUNITIES

Tools, Courses, Packages	Contact
Countdown Downunder – Farm Guidelines for Mastitis Control	Local Veterinarian, NSW Agriculture (District Office)
Milking machine industry	Milking machine companies

SECTION 4

Audit of Your Existing Effluent Management System

This audit will help you to determine if your dairy effluent management system meets the requirements of the Protection of the Environment Operations Act 1997, and the NSW Guidelines for Dairy Effluent Resource Management;

The effluent management system best suited to your farm will depend on a number of factors including farm size, farm lay-out, topography, effluent volumes, labour and capital resources, and available farm machinery.

It is important to ensure that dairy effluent:-

- does not pollute any watercourse including underground water.
- does not concentrate nutrients and/or water in the soil.
- does not pollute neighbouring properties.
- is not offensive in sight, odour, noise or dust.

This audit only covers dairy effluent that is collected from the bails, holding yard and adjacent concrete areas. Other cattle congregation areas (feed pads, entry and exit laneways, gravelled holding yards, cattle camps) can cause similar pollution problems, and are dealt with in a separate package.

Footnote:

*This audit is **not** a detailed examination of the effluent management system; there are no calculations to determine whether the pond size and the land application area are adequate for the amount and concentration of effluent generated. However you must complete these calculations (water, nutrient, organic matter and salt balances) as part of the design process outlined in Step 10 in Section 5.*

DAIRY EFFLUENT MANAGEMENT AUDIT

STEP ONE

Question – Are you milking more than 800 cows now, or expect to within the next 2 years?

☐ YES ☐ NO

If **"YES"** you must be licensed by the EPA. Contact your nearest E.P.A. Office; they will advise you on how to get a licence for your existing dairy effluent management system. There is no need to continue with this self-assessment, as the E.P.A. will conduct a thorough assessment of your existing effluent management system.

If **"NO"** your effluent management system must not contravene the Protection of the Environment Operations Act 1997 and should meet the NSW Guidelines for Dairy Effluent Resource Management. Move to STEP 2.

STEP TWO

AUDIT OF EXISTING EFFLUENT MANAGEMENT SYSTEM

Fill in the audit of your current effluent management system.

Collection

a) Estimate the proportion of effluent coming from the milking shed and adjoining concrete areas that are effectively collected.

Proportion of milking shed waste collected

☐ less than 100% ☐ 100%

b) What happens to rain water from the roof of the milking shed?

Rain water from the milking shed roof

☐ enters the effluent management system ☐ collected or diverted away from the effluent management system

c) What happens to rain water that falls on the holding yard, and entry and exit areas?

Rain water from the holding yard, and entry and exit areas

☐ enters the effluent management system

☐ diverted away from the effluent management system

Solids separation

d) What method of solids separation (separating stones, gravel, foreign objects from the effluent) does your present system use?

☐ none ☐ grate/gravel trap ☐ trafficable solids trap ☐ earthen sediment bay

☐ other (describe) ……

e) Is your solids separation system effective?

☐ YES ☐ NO

Storage

f) What method of storage does your present system use?

☐ none or less than 2 days storage ☐ tank or sump (greater than 2 days storage) ☐ 1 pond ☐ 2 or more ponds

☐ other (describe) …….....……..

NOTE: Tanks and sumps of less than 2 days capacity do not constitute storage ie: "none".

g) **Does your storage system have sufficient capacity to hold effluent for the wettest period of the year when you cannot apply the effluent onto pastures without waterlogging, run-off, or contamination of ground-water occurring?**

☐ YES ☐ NO

Distribution

h) What method of distribution or land application does your present system use?

☐ none ☐ spray irrigation ☐ flood banks ☐ contour ☐ mobile tanker ☐ moveable open pipe

☐ other (describe)……

"None" includes a drain or a fixed pipe into a paddock or bog hole.

"Spray" means a moveable spray, or through an irrigation system.

"Flood" means effective distribution by adding reclaimed water to flood irrigation water.

i) Is your land application site large enough to prevent waterlogging, run-off into waterways, or percolation through the soil profile into the ground-water?

A guide for reclaimed water distribution is: -

- minimum 6 ha/100 cows (raw effluent)
- minimum 3 ha/100 cows (ponded water)

☐ YES ☐ NO

Buffer Zones

j) Does your effluent management system exceed the recommended minimum buffer zone distances?

☐ YES ☐ NO

RECOMMENDED MINIMUM BUFFER ZONES FOR BEST PRACTICE

	Dairy	Existing Neighbouring House*	Boundary Fence*	Water Course	Domestic Bore	Public Roads
Pond	45m	200 m	100m	50m 20m #	250m	50m
Manure heap, sludge stockpile	45m	200 m	100m	100m	250m	50m
Land application	45m	100m	10m	50m	250m	5m

**A conflict in buffer zones can occur between "existing neighbouring house" and "boundary fence". Use the large if the neighbouring house is within 100 metres of the boundary. Potential neighbouring house sites need to be tak consideration as well as existing dwellings. Care should be taken to minimise the use of your neighbour's property buffer zone for your effluent management system.*

 # Permit required from DLWC and Local Council.

Specialist advice is necessary from DLWC where a town water supply bore is within 1000 metres of the effluent management system.

Safety

k) Are there adequate gates and fences around ponds, storage tanks and solids separation pits to prevent people and stock from accidentally getting in?

☐ YES ☐ NO

l) Are signs placed around ponds, storage tanks and solids separation traps explaining "deep water" and " surface crust will not support weight"?

☐ YES ☐ NO

m) Are safety guards installed on pump belts and pulleys?

☐ YES ☐ NO

Animal Health

n) Are calves under 12 months, forward springers and milkers prevented from grazing paddocks that are used for land distribution of dairy effluent?

Calves under 12 months ☐ YES ☐ NO

Forward springers ☐ YES ☐ NO

Milkers ☐ YES ☐ NO

Assessment

o) Is the system fully operational?

☐ N/A ☐ YES ☐ NO

(If NO - why?) ……

"N/A" means there is no system.

"YES" means that maintenance of the system will keep it operational. (We must acknowledge that any system will have occasional down-time).

er value
en into
y as the

"NO" means the system has fallen into general disrepair and is unlikely to be fixed.

p) Overall, – does the management of milking shed waste meet Industry objectives?

The Industry objectives can be summarised as - "That waste:

- does not pollute any water course including underground water
- does not concentrate nutrients and/or water in the soil
- does not pollute neighbouring properties
- is not offensive in sight, odour, noise or dust.

☐ YES ☐ NO

(If NO – why?) ……

☐ stock health issues

☐ sight/odour/ noise/dust problem

☐ insufficient buffer distance

☐ insufficient distribution

☐ indirect discharge into waterways

☐ direct discharge into waterways

☐ no wet weather management system

☐ safety issues

☐ other (describe) ……..…

Indirect Discharge means effluent will enter a watercourse as a result of run-off from the land disposal area after any rain event.

STEP THREE

EVALUATION OF THE AUDIT

- At **"COLLECTION"** if you **did not** tick ***"100%"*** at **(a)** you have a problem. All the areas where cows congregate in and around the dairy should have effluent management systems to prevent pollution.
- If you ticked ***"enters the effluent management system"*** at **(b)**, has the system been designed to handle the extra water? If not, you have a problem.
- If you ticked "***"enters the effluent management system"*** at **(c)**, has the system been designed to handle the extra water? If not, you have a problem.
- If you ticked ***"diverted away from the effluent management system"*** at **(c)**, are the holding yards, and entry and exit areas cleaned after each milking? If not, you will have a pollution problem during wet weather from the rain water run-off from the dirty yards.
- At **"SOLIDS SEPERATION"** if you ticked ***"none",*** at **(d)**, what precautions have been taken to prevent stones, gravel and foreign objects blocking the distribution or land application system?
- If you ticked ***"no"*** at **(e)**, determine if the problem is caused by poor design, or lack of maintenance. Is lack of adequate solids separation causing a problem with the performance of the effluent management system?
- At **"STORAGE"** if you ticked ***"none"*** or ***"tank or sump greater than 2 days storage"*** at **(f)**, does the dairy effluent cause pollution problems during wet weather? If there is a potential problem, storage facilities should be incorporated into the system.
- If you ticked ***"no"*** at **(g)**, determine if this problem is caused by lack of storage capacity or lack of maintenance (eg. sludge build up).
- At **"DISTRIBUTION"** if you ticked ***"none"*** at **(h)**, you have a problem. Concentrating nutrients and effluent in the soil is considered pollution, and your effluent system should be designed to ensure that this does not occur.
- If you ticked ***"no"*** at **(i)** you have a problem. Increase the land application area, move the sprinkler more often, or use a wet weather storage system.
- At **"BUFFER ZONES"** if your ticked ***"no"*** at **(j)** you have a potential problem. Ensure any new effluent management structures exceed the recommended minimum buffer zone distances and managed correctly.
- At **"SAFETY"** if you ticked ***"no"*** at **(k) (l)** or **(m)** you have a problem. You have a legal and moral obligation to identify and restrict human and stock access to potentially dangerous sites on your farm.
- At **"ANIMAL HEALTH"** if you ticked ***"no"*** at **(n)** you have a potential problem. Dairy effluent can harbour pathogens that can cause mastitis in milkers and forward springers, spread Johnes Disease to young calves, and contaminate milk. Restriction of stock on distribution sites is also a requirement of on-farm quality assurance (HACCP) programs.

- At **"ASSESSMENT"** if you ticked either ***"no"*** or ***"n/a"*** at **(o)** you have a problem. Effluent management systems that are not fully operational and correctly designed will cause pollution problems.

If at **(p)** you ticked ***"no"*** you should have been able to identify the problem or problems with your existing management system that needs to be addressed.

Section 5 of this manual will allow you to determine the most appropriate upgrade of your existing effluent management system, or the best design for a new system.

Using the Effluent Management Audit and knowledge of your operations, please consider the following questions…..

What are your strengths in Effluent Management?

WHAT are your opportunities in Effluent Management?

WHAT do you need to change?

WHAT are the most pressing changes?

WHAT will you address first?

WHAT will you achieve by taking action?

SECTION 5

Designing Your New or Upgraded Effluent Management System

Dairy effluent is a resource containing water, solids, organic matter, salts and nutrients. The most efficient management system should concentrate on:

a) reducing the volume of effluent produced,

b) reclaiming all effluent at the bails and immediate surrounds,

c) recycling all the water, solids, organic matter, salts and nutrients.

The following check list will help you design the most appropriate effluent management system for your farm.

STEP ONE

Question – Are there any plans to do any of the following within the next 5 years:-

- increase herd size
- increase yard size
- alter the dairy
- alter water consumption for cleaning of yards and machines
- alter yard cleaning method
- alter storm water run-off diversion or collection from yards and sheds

☐ YES ☐ NO

If "***YES***", your current dairy effluent management system may not be able to handle the increased loading of water, solids, organic matter, salts and nutrients.

STEP TWO

If your effluent management system has passed the audit (Section 4) and you answered "***NO***" to STEP 1, there is no need to continue working through this section.

If your audit evaluation indicated that you have a problem, or you answered "***YES***" at STEP 1, continue to determine the most appropriate effluent management system for your farm.

STEP THREE

The Planning Process

- Source available information on dairy waste systems from NSW Agriculture, Department of Land & Water Conservation and the local council.
- Check with the local council on the level of documentation required with your application.
- Inspect completed on-farm systems and talk to the owners.
- Obtain specialist advice.

STEP FOUR

Calculate the volume of dairy effluent produced per day to be reclaimed and recycled.

Include:
a) yard wash-down volume
b) milking machine & vat wash volumes
c) roof rain water if not diverted
d) yard rain water if not diverted

This information will be required to calculate pond sizes and land application areas at Step 10.

STEP FIVE

Identify all cattle congregation areas that need to be included in the effluent management system. (bails, holding yards, immediate laneways, feed pads etc).

STEP SIX

Question – Do you require solids separation to be incorporated into the system?

☐ YES ☐ NO

Solids separation will help prevent pump and spray blockages, increase the life of pumps, increase intervals between de-sludging of ponds, reduce land distribution area required, but increase capital and labour requirements.

Question – Which solids separation system is best suited to your farm?

Grate or gravel trap	– cheap – not very effective – daily cleaning
Trafficable solids trap	– effective – front end loader required – expensive
Earthern sediment bay	– effective – cheap – difficult to empty

STEP SEVEN

Question - Do you require to store your dairy effluent for an extended period of time.

☐ YES ☐ NO

What safety precautions are in place to prevent polluting waterways during wet periods? (eg. a large land application site well away from any waterways).

Question - Which storage system do you prefer?

1) tank or sump with greater than 2 days capacity
   – minimal space
   – moderate cost
   – no treatment
   – frequent emptying

2) one pond
   – low treatment
   – often lowest cost per litre of storage

3) multiple ponds
   – higher level of treatment
   – suitable for re-cycling as flood wash
   – occupy largest area
   – most expensive.

STEP EIGHT

Question - Which land distribution system do you prefer?

1) Dedicated spray irrigator
   - good distribution if moved when required
   - can be self propelled
   - expensive
   - moderate labour

2) Existing farm spray irrigation system
   - low cost
   - excellent distribution
   - low labour
   - unable to handle any solids

3) Existing flood irrigation
   - low cost
   - low labour
   - excellent distribution
   - can cause pollution problems of supply & drainage channels

4) Contour Banks
   - low labour
   - disturbs paddocks
   - moderate cost
   - poor distribution
   - **not recommended**

5) Mobile Tankers
   - ideal distribution
   - high daily labour requirements
   - expensive
   - wet weather problems if cannot drive on paddocks

6) Moveable open pipe
   - low cost
   - requires daily movement (which is easily overlooked)
   - poor distribution
   - high labour
   - unreliable
   - **not recommended**

STEP NINE

Selecting the most appropriate site

Integrate with whole farm plan – allow for future property development.

- Get a topographical survey if required.
- Check the soil suitability for proposed works.
- Consider future development of neighbouring properties.
- Land capability/sustainability for effluent reuse.
- Exclude land with potential for degradation/erosion
- Ensure there is an adequate area of land for waste disposal
- Comply with buffer zone recommendations.

STEP TEN

Confirm the suitability of your preferred design as determined by Steps 4- 9 inclusive

- A water, nutrient, organic matter and salt balance is required to ensure that the storage and land application site are correctly sized.
- Ensure appropriate human and stock safety measures are incorporated in the design.
- Consider using a qualified consultant.
- Consult with NSW Agriculture and the Dept Land & Water Conservation.
- If ponds are included, confirm suitability of site and soils by digging a trench 0.5 metres below proposed pond base. Examine profile and test soil for sealing capality.
- Finalise plans & documentation.

STEP ELEVEN

The approval process

- Submit application to:-
  - Local Council (and if the proposal development is likely to pollute waters, the NSW EPA).
  - DLWC for Water licence.
  - DLWC for Clearing consent (if required).
  - DLWC and the Local Council for earthworks within 40 metres of a watercourse.
  - DLWC if within 1000 metres of a town water supply bore.

STEP TWELVE

The Construction Process

- After approval has been received, obtain 2 or 3 quotes for construction (with fixed prices).
- Finalise a contract with selected builder.

STEP THIRTEEN

Required inspections

- Arrange final inspection of completed works by:-
  - the Local Council.
  - the NSW EPA if a licence under the POEO Act has been applied for.

STEP FOURTEEN

Operation & Monitoring

- Operate the system in accordance with the design approval and best management practice.
- Ensure human and stock safety measures are maintained.
- Monitor the system's sustainability.

KEY TRAINING OPPORTUNITIES

Tools, Courses, Packages	Contact
NSW Guidelines for Dairy Effluent Resource	NSW Agriculture (District Office), Local Council, EPA
Management Managing Dairy–shed Wastes Volume 1 Volume 2	Roger Wrigley VCAH, Dookie campus
Code of Practice for Dairy Buildings (9/1995)	Safe Food Production NSW. (ex NSW Dairy Corporation)
Countdown Downunder - Farm Guildelines for Mastitis Control	Local Veterinarian, NSW Agriculture (District office)
Intensive Agriculture and the Development Control Process	NSW Agriculture Agnote DPI/261

APPENDIX I

Checklist Summary

Date:___ /___ /___

FARMER: _____ LOCATION: _____

PHONE: _____ _____

TENDER DOCUMENT-QUESTION SHEET

This checklist has been prepared as a guide to ensure all essential criteria associated with your upgrade or new milking shed has been covered. To use these checklists simply circle the preferences, add measurements, and add comments in spaces provided.

The purpose of the check is to formulate a customised tender document that can be used when obtaining quotations for your new project. It will also serve as a memory jogger when establishing both the needs and contents of your quotations.

MILKING SHED DETAIL	**OPTIONS (circle or fill in)**					
MILKING MACHINE SET-UP	swing over	double up				
NUMBER OF COWS ON SIDE	……cows					
ANGLE THE COWS STAND	45 degree	80-90 degree	other.....			
COW RESTRAINTS IN A 80-90^0 HERRINGBONE	feed trough dividers	head stalls	mechanical stall gates	other		
EXIT TYPE	conventional	rapid exit				
A WALKWAY IN FRONT OF THE COWS HEADS?	no	yes	..... mm wide			
WIDTH OF PIT	…..…… mm					
DEPTH OF PIT	……..… mm					
PLATFORM OVERHANG	……..… mm					
COW EXIT	exit laneway to return cows to behind the holding yard backing gate	straight out the front	out the side	other		
EXIT GATES	pendulum	lift up	hinged	other ……..…		
ENTRY GATES	pendulum	lift up	hinged	chain	none	other .....

45^0 BREAST RAIL	zig zag	straight				
45^0 BREECH RAIL	zig zag	straight				
NIB REQUIRED	yes	no				
NIB CONSTRUCTION MATERIAL	steel	concrete				
SPLASH GUARDS	yes	no				
SPLASH GUARD MATERIAL	opaque – galvanised sheet steel or stainless steel	transparent – perspex or poly carbonate				
SLOPE OF MILKING AREA	towards holding yard	away from holding yard				
LOCATION OF THE BULK MILK VAT	in milk room	outside				
LOCATION OF THE MILK ROOM IN RELATION TO THE MILKING AREA	at the exit end of pit	to the side				
THE SIZE OF THE MILK ROOM	……..mm X …….mm					
EXTRA ENCLOSED ROOMS	no	yes				
(if yes circle)	wash room	office	store room	machine room	toilet	staff facilities
	other…….……					
EXTRA FACILITIES REQUIRED	drafting	holding pens	crush	race	loading ramp	hospital area
	other……					
SHED CONSTRUCTION	purpose built	steel shed				
ROOF PROFILE	flat	pitched				
HOLDING YARD SIZE	……..…… cows					
HOLDING YARD SHAPE	round	rectangular				
YARD ENTRY GATE LOCATION						
RECTANGULAR	back	side				
ROUND	describe……					
YARD BACKING GATE	solid/ mechanical	electric curtain	other	none		
YARD WASHING	hose	flood	other ……..……...			

COW COOLING SYSTEM	fans	yard sprinklers	covered yard	none	other ……
DAIRY EFFLUENT COLLECTION	drive-in solids trap	sump & pump	drain		
FEEDING DURING MILKING	yes	no			
FEED DELIVERY SYSTEM	auger	cable	flat chain	centre-less auger	
FEED HOPPER CAPACITY	large	small			
FEED BIN MATERIAL	stainless steel	fibreglass	galvanised steel	plastic	

MILKING MACHINES

VACUUM PUMP	oil lubricated	water ring	lobe pump	vane pump
AIR LINE MATERIAL	stainless steel	plastic		
MILK LINE CONFIGURATION	looped	dead end		
MILK PUMP	centrifugal	diaphragm	flexible impeller	
PULSATOR CONFIGURATION	2 x 2 (alternate)	4 x 0		
PULSATOR TYPE	pneumatic self drive	pneumatic master and slave	electronic master and slave	electronic independent
CLUSTER WEIGHT *(CLAW + CUPS + LINERS)*	heavy over 2 kg	light under 2 kg		
CLAWS	conventional size (100 - 200 ml capacity)	larger capacity (200 - 450 ml)		
SHELLS	light weight	heavy weight		
LINERS	brand ……..……..	model……..		
MILK FILTER	disposal socks	re-usable socks		
NEW BULK MILK VAT	direct expansion	ice bank	glycol thermal storage	glycol direct expansion
BULK MILK VAT CAPACITY	……..…… litres			

EFFLUENT MANAGEMENT SYSTEM

SOLIDS SEPARATION	yes	no		
SOLIDS SEPARATION SYSTEM	grate or gravel trap	trafficable solids trap	eathern sediment bay	
DAIRY EFFLUENT STORAGE	yes	no		
STORAGE SYSTEM	tank or sump with greater than 2 days capacity	one pond	multiple ponds	
LAND DISTRIBUTION SYSTEM	Dedicated spray irrigator	existing farm spray irrigation system	existing flood irrigation	contour banks (not recommended)
	mobile tankers	moveable open pipe (not recommended)		

APPENDIX II

The Building Process

After you have completed the sections on herringbone shed design, milking machine selection effluent management and the tender document, you should have a clear and concise description on the new or up-graded dairy that you require.

The following will help you get your proposed new or up-graded dairy from an idea to reality.

STEP ONE

Visit dairies that are similar to your proposed new dairy to ensure that your ideas are workable. Talk to the owners and the milkers to see if they would change anything and observe how well the shed performs.

STEP TWO

Plans need to be drawn up for your new dairy based upon you completed Sections 1,2 & 3. The plans should show a floor plan, cross section, side elevations, site plan and effluent management plan, detailing dimensions, construction materials and sizes, spacings etc. Engineer certificates may be required for footings, concrete slab design and re-enforcing and the shed. Local Council will advise you. An Engineers Certificate will be supplied with purchased steel sheds. The effluent management plan should comply with the NSW Guidelines for Dairy Effluent Resource Management detailing both design and management of the system. Local Council is the consenting authority on the effluent management system and may impose more stringent conditions than outlined in the Guidelines if they consider there is a threat to the environment.

Obtain a copy of the Code of Practice for Dairy Buildings (September 1995) from the Safe Food Production, NSW. Your dairy must comply with this Code and Local Council requirements.

STEP THREE

Contact the Department of Land & Water Conversation to see if there are any issues that may concern them about your proposed new dairy such as proximity to watercourses, earthworks for the effluent ponds, land clearing etc.

STEP FOUR

Decide who is going to build the dairy - you as an owner builder, or a licensed builder. If you are doing the building as an owner builder, you will not require an owner builder's permit as the dairy is classed as commercial. Check with the Australian Taxation Office about your obligations regarding employing building contractors. The Prescribed Payments System (PPS) has been replaced by the Goods and Services Tax system.

If you are going to use a licensed builder, make sure their license is current. It is advisable to get quotes on the building from three (3) different builders. These quotes should be fixed for a period of time. However, the builders may not be able to finalise their quotes until the plans are approved as there may be some un-expected additional requirements imposed by local council.

STEP FIVE

Submit the completed plans to Local Council for approval. A Local Development Approval and Construction Certificate will need to be lodged with the plans. A Statement of Environment Effect may also have to be submitted with the plans outlining the nature of enterprise and it's effect on the surrounding environment. There may be specific issues that need to be addressed such as acid sulphate soils, flooding, noise, traffic etc. Local Council will advise you on what extra documentation is required.

If you intend to milk more than 800 cows, the EPA will require you to be licensed and request detailed documentation on the enterprise which may include an Environmental Impact Statement.

If you are housing animals your enterprise may be classified as a feed-lot and you will have to comply to the code of practise for feed lots.

Where Local Council considers there may be a threat to the environment or conflict with neighbours, or there are objections to the proposed development by the public, Local Council may seek comment from other Government Agencies (NSW Agriculture, EPA, DLWC, DUAP) before approval is granted. This is called the development control process for intensive agriculture. You will have to provide detailed documentation of effluent management, traffic, noise, odour, dust, visual impact, stock movement etc which will require, in most cases, the employment of a consultant to provide the required information on your behalf.

STEP SIX

Finalise the quotes with the builders after the plans are approved. Ask for names and addresses of previous buildings completed by them so you can inspect their workmanship. Talk to the owners and see if there were any problems with the builder.

Once you have chosen the builder, a contract should be negotiated documenting prices, payment schedules, commencement and completion dates, inclusions and exclusions, warranty, and any other issues that need to be documented.

STEP SEVEN

Contact Safe Food Production NSW (ex NSW Dairy Corporation) to find out if they have any requirements in relation to your HACCP program.

STEP EIGHT

Contact your dairy factory to find out their requirements for tanker access - road width, turning bay diameter, vat access etc.

STEP NINE

Decide which milking machine technician will be installing the machines, vat and other associated components. Make sure they are involved from the beginning to ensure their requirements are met.

STEP TEN

Stick with the program. Don't get talked into changing the plans and compromising the shed's performance just to make it easier for the builder. If you change your ideas on what you want during construction, you may be up for additional expenses.

STEP ELEVEN

If you are an owner builder it is your responsibility to keep the sub-contractors informed on the progress and when their services are required. Involve the milking machine technician during the construction of the dairy to ensure that services (power and water) are located in the required positions, as well as support pipes, holes through walls etc.

STEP TWELVE

Local Council may require site inspections for drainage, footings, (before pouring), slab re-enforcement (before pouring), frame, and final. Make sure these are carried out if requested.

STEP THIRTEEN

Inspect the building during construction regularly to ensure it is to your specifications. Common problem areas are:-

- bail pipe-work stanchions in the wrong location
- shrinkage cracks in the concrete
- concrete surfaces too slippery or too rough
- concrete allowed to cure too fast resulting in a poor wearing surface
- floor slopes wrong allowing pooling of water
- concrete re-enforcing in the milking area not welded together and to the pipe stanchions, then earthed.

STEP FOURTEEN

Make the final payment after completion and the building meets the specifications of the plans and Local Council requirements.

STEP FIFTEEN

Arrange for the milking machine technician to install the machines and other associated equipment as per the agreed tender document. Final payment for the machines should be made after commissioning and they are working to the manufacturers' specifications and your satisfaction. Insist on a "milking time" test of the milking machines one month after the plant has been commissioned to ensure that the working vacuum at peak flow rates is to AMMTA specifications.

If you have a dispute with the builder or sub-contractors, The Department of Fair Trading can assist. There is also a Fair Trading Tribunal that can adjudicate if the dispute needs legal interpretation.

APPENDIX III

Partial Budgeting

The decision to continue milking in your older inefficient shed, or upgrade into a new or modified shed requires careful planning.

A partial budget can be used to calculate the financial implications (cost benefit analysis) of a new or modified shed.

New/modified shed partial budget

Positive Impacts

1 *Increased Revenue*
- More time to do other farm work
- Time to work off-farm
- More milk
  - increased grazing time
  - less cow discomfort

2 *Reduced Costs*
- Less Labour
- Lower repairs and maintenance on shed
- Lower operating costs

Negative Impacts

1 *Reduced Revenue*

2 *Increased Costs*
- Interest on borrowed money
- Opportunity costs if own money used
- Depreciation
- Service of new milking machine

Qualitative impacts need to be taken into consideration that cannot be allocated a dollar value. The main qualitative positive impact is time that could be used for personal/family/leisure activities.

A new/modified shed may not be able to be justified purely in financial benefits outweighing costs without taking qualitative impacts into consideration.

NOTES:

DAIRY DO IT!

An initiative of the NSW Government and Dairy Industry

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