FULL-SEASON ONCE-A-DAY MILKING SYSTEMS;
SUCCESSFUL METHODS AND FARM PERFORMANCE .

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INTRODUCTION

Many methods and practices used on once-a-day (OAD) farms are the same as those used on twice-a-day (TAD) farms. However, there are some differences.

Methods for which OAD differs from TAD will be described briefly, and methods that are believed to be even more important for OAD than for TAD, will be emphasised.

Finally, some information is presented about the levels of performance that can reasonably be expected from OAD systems.

The information below has been compiled mainly from the collective wisdom of experienced and successful OAD dairy farmers, members of the Southern North Island OAD Discussion Group.

Other sources of information;

- **Proceedings of the OAD Milking Conference, 2007; available from LIC, Hamilton.**
- **Workshop on OAD Milking Systems at the South Island Dairy Event (SIDE), Lincoln University, June 2011. Both are available at:**

http://www.dairynz.co.nz/page/pageid/2145867877/Conference_Proceedings

1. PREPARATIONS BEFORE THE CHANGE TO OAD

(These should help to minimise the decrease in yield per cow and the increase in SCC that are generally expected after the change to OAD).

Type and age of cows

- As for TAD, high BW cows are also generally best for OAD too [but see Breeding Programmes for OAD cows, in 2. below]. Compared with TAD, milksolids [MS] yields per cow are generally decreased on OAD, but this decrease is smaller for Jerseys and J x HF crossbreds than for Holstein Friesians.
- Good udder conformation is especially important for OAD, because with nearly 24 hours between milkings, the udders will be full, heavy and tightly-stretched before each milking.

- Udders must be strongly attached to the body, with evenly-sized quarters, and well-placed teats that can be milked easily even when the udder is full.
- Cows that have records showing clinical mastitis, and/or high SCC should be culled before OAD begins. Limited evidence shows that cows with low SCCs are likely to be less affected by OAD than are cows with high SCCs.
- **Strong, healthy udders, with low SCCs are a prerequisite for a OAD herd**
- Including a high % of 2-year-olds into the herd will enable more voluntary culling; and 2-year-olds generally have lower SCC than older cows, and higher BWs. But 2-year-olds produce about 25% less per cow than mature cows.
- In an attempt to identify cows not suited to OAD; OAD could be used for the last months of the final TAD season, and those cows that dry themselves off quickly, and become fat when milked OAD could be culled or sold-on.

Drying-off at the end of the final season on TAD, and mastitis control

- Take this opportunity to eliminate/control/cull any mastitis problems, and cows with weak udders, before OAD begins.
- If there is evidence of a mastitis problem in the herd [e.g. herd SCC above 250,000], serious thought should be given to the use of DCT and Teat-Seal on **all** cows; and also to the use of Teat-Seal in the heifers, about 4 to 5 weeks before calving for their first time.
- At the very least, stick to the guidelines given in the SAMM plan, with respect to treatment and culling.

Stocking rate [cows per ha] for OAD

- In the first season after the change from TAD to OAD, milksolids yield per cow is likely to be lower by 10 to 25%. Consequently, at least for the first year or two on OAD, an increase in cows/ha (by 10 to 15%) is often recommended, to compensate for the expected decreases in pasture eaten per cow and milk produced per cow.
- In the early part of the first season on OAD, it will probably be necessary to remove about 10% of cows, because they are obviously unsuited to OAD (unless cows not suited to OAD had already been identified and culled in the season prior to the change to OAD). Extra cows should be calved to allow for this enforced early culling, or on-selling.

- BUT BEWARE! If the increase in stocking rate is too large, it will cause periods of pasture deficit, with consequent decreases in pasture intake and yield per cow; in this case, milksolids yield per cow would be depressed by both OAD and underfeeding.
- Therefore, any increase in cows per hectare should be calculated carefully, to ensure that, 1;.the farm will not be over-stocked; but, 2; there will be enough cows on-farm to enable early culling of those that are unsuited to OAD, and also to fully utilise the pastures.

Milking machine

(On OAD, the udders are likely to be very tight and full before each milking; thereforey, during milking, the rate of milk flow will be faster than on TAD. These conditions may necessitate some changes in the machine).

- Cup slip can be a bigger problem on OAD; seek advice from experienced OAD farmers or from milking specialists, about the type of milking cluster and teat-cup liner that are best for OAD.
- Ensure that the machine's vacuum level is stable, and at the correct level, during the whole milking; the machine must have sufficient reserve air-flow capacity.
- The milk line, milk pump, and the milk cooler and refrigeration unit must all have sufficient capacities to cope with the faster rates of milk flow expected on OAD.

2. PRACTICES FOR OAD

Springers and colostrum cows

- Collect cows and calves on the day of calving, and milk the cows OAD from then on. One OAD farmer milks the main herd and switches-off the machine. The freshly calved cows are then collected and milked, followed by the colostrum & sick cows. The milking plant is then washed and finally switched-off for the day [In the cooler weather of spring, the plant can safely be left unwashed for an hour or two].
- Colostrum should be withheld from the vat for 4 days (or 4 milkings) for cows and for 5 days (or 5 milkings) for heifers. [At least one OAD farmer has used the normal TAD withholding period of 8 milkings [or 8 days on OAD) for cows calved in the first week; and gradually reduced this down to a 4 milkings (4 days) for cows calving in the fourth week].

- During these withholding periods, the colostrum is also likely to meet the new-born calves' needs for immune proteins (i.e. in the first day of life, 4 litres of colostrum per calf, preferably from the cow's first two milkings).
- If colostrum is to be supplied to Fonterra; collect colostrum from the first two milkings, or days, to ensure sufficiently high concentrations of immune globulins.
- While still in the colostrum herd, check all quarters/cows with the Rapid Mastitis Test.
- Do not put a cow's milk into vat unless RMT indicates a low SCC.
- It is advisable to inspect newly-calved colostrum-cows twice a day, to minimise losses e.g. from milk fever. If dusting pastures in wet weather eg with magnesium chloride, do it twice a day.

Milking methods; mastitis and its treatment

Generally these are the same as for TAD; BUT, on OAD, there are 2 potentially important differences: *1. Just before cups-on, the udders will be even fuller and tighter than on TAD. 2. After cups-off, it will not be possible to inspect the teats/udders closely for the next 24 hours, much longer than on TAD. In addition, this longer inter-milking interval may enable mastitis infections to become more firmly established before the next milking.*

- **MUST** ensure that teat cups are aligned correctly on the teats, and that they stay in place without slipping.
- **MUST** ensure that all udders/quarters have been thoroughly milked-out and are empty before cup removal.
- **MUST** look for, detect and attend to, any abnormal quarters (e.g. full/hard/hot), after every milking, (especially if cups are removed by automatic devices).
- Some farmers strip fore-milk from one quarter of all cows at one milking (e.g. front right), and rotate around the udder so that, after 4 milkings, all 4 quarters of every udder have been checked for abnormalities.
- One OAD farmer, who pressure-washes the teats/udder before cups-on, believes that this helps the cows to milk out more evenly.
- **MUST** ensure that every teat is disinfected thoroughly after every milking; this is probably even more essential than it is on TAD *(and discovery of a teat sanitiser that protected the teats for the full 24 hours, would be of special benefit on OAD).*

- Another OAD farmer reports good results, including reductions in clinical mastitis and animal health costs, after installation of a new automated cluster/teatcup system. Immediately after milk flow from the cow ends, this system sanitises each teat, and then, after automatic cup removal, rinses each teat cup liner.
- After every milking, the milk filter should be inspected for any abnormalities. If clots are discovered, the culprit-cows should be identified at the next milking, by inspecting fore-milk from suspect cows. Cows showing abnormalities in their milk should then be tested with the RMT *(on OAD, it is possible that infected cows produce clots that are more easily detected on the filter).*
- **Withholding times after antibiotic treatment**; if a product is not registered for OAD milking, use the number of **milkings** recommended for TAD (e.g. if 48 hours & 4 milkings recommended on TAD, then use 4 milkings, or 96 hours, on OAD); that is, the withholding time on OAD will be twice as long as for TAD.
- However, Pfizer Animal Health Company recently published details about 2 antibiotics, for which the recommended withholding times for OAD are *NOT* twice as long as those for TAD, as shown below;

  Lincocin Forte S; 3 tubes at 24 hour intervals; withholding time for OAD = 96 hours or 4 milkings *(for TAD= 60 hours or 5 milkings).*

  Orbenin LA;

  Either 3 tubes at 48 hour intervals; withholding time for OAD = 72 hours or 3 milkings *(for TAD= 84 hours or 7 milkings).*

  Or 5 tubes at 24 hour intervals; withholding time for OAD = 96 hours or 4 milkings *(for TAD= 96 hours or 8 milkings).*
- Because, on OAD, antibiotics can be infused only once per 24 hours, it may be advisable to administer more than the minimum recommended number of tubes for effective treatment, and over a longer period (e.g. instead of 3 to 4 days recommended minimum on TAD, administer for 4 to 5 days on OAD); seek veterinary advice.
- Even though the herd is on OAD, some vets recommend that cows being treated with antibiotic for clinical mastitis, should be milked TAD during treatment. This more frequent removal of infected milk from the quarters, and more frequent infusions of antibiotics may assist cure and recovery.

Cows in normal lactation (e.g. more than 20 to 30 days after calving)

- Just as for TAD cows, OAD cows need to eat sufficient feed to maintain themselves, and pregnancy, and to produce milk. They need more feed to produce more milk, as will occur as cows unsuited to OAD are culled. Many, but not all, OAD herds feed some supplements, mainly silages, PKE and hay.
- Grazing management is generally similar to TAD; targets for pre-grazing yields and post-grazing residuals are the same as for TAD.
- Generally, most OAD farmers shift cows onto a fresh area of pasture twice a day; but some shift them only once. The herd, and its water supply, should be checked twice a day.
- To ensure good milk production, cows must consume sufficient Metabolisable Energy each day. Therefore the cows must be offered enough pasture each day, and the pasture must be of high quality [ie; high % of young green leaf, high digestibility, high MJME/kg DM]. These factors are essential for all cows; but they may be even more essential to entice cows on OAD. Therefore excellent management of grazing and feeding is essential for OAD cows, to ensure long productive lactations.
- A 4 year trial in Taranaki comparing Holstein-Friesians and Jerseys milked either OAD or TAD showed that OAD reduced the time from calving to conception by 5 days and increased 3-week pregnancy rate by 8%, but with no change in final pregnancy rate. The percentage of Holstein-Friesians cows treated with CIDRs was substantially reduced from 24% for TAD to 5% on OAD, but with no difference for Jerseys (average 7%).
- In a 640 cow Jersey herd in the Waikato, milking approximately half the herd OAD for 2 years, empty rates for those on OAD were 3-4%, but 8-9% for those on TAD
- Most OAD farmers use Tail Paint to assist with detection of cows on heat; some observe cows and their tail paint for signs of heat only at the one milking per day, while some also observe the cows while they are undisturbed in the paddock. All seem to achieve very good submission and pregnancy rates, with compact calving periods and a low percentage of empty cows.

Breeding programmes for OAD herds

Most of the group members are farming with high BW Holstein Friesian x Jersey crossbred cows (see below for the effects of OAD on different breeds). But some OAD herds comprise mainly Holstein Friesians or Jerseys. Some members have used sires with high OAD BWs.
A successful OAD farmer, now in the 8th year on OAD, milks Jersey cows producing 340 to 370 kg MS/cow. He uses the criteria shown below to choose sires for use via AB;

i. High BW.
ii. Negative values for BV Milk; e.g. from – 300 BV milk up to 0 BV milk (for Jerseys). Small +BV milk values can be accepted if all the traits below are very good.
iii. BV for udder support BV must be always positive i.e. + 0.3 or better.
iv. BV for SCC must always be negative e.g. BV-0.3; and the bigger the negative value is, the better.
v. BV for protein % must be positive; e.g. BV +4 or better.
vi. Farmer Traits BVs should all be positive, especially Temperament & Milking Speed.

3. HERD PERFORMANCE ON OAD *(reasonable expectations).*

Yield of MS per cow for a full lactation; in the short term, this is likely to be lower than would have been expected on TAD.

- Jersey cows, and older cows generally show the smallest decreases; while Holstein Friesian cows and 2 year olds show the largest decreases. For example, 15% decreases in mature Jerseys; 31% decreases in 2 year old Holstein Friesians.
- Limited evidence shows that these decreases in yield on OAD are smaller in cows with low SCCs .
- These lower yields of MS per cow would be expected to reduce the cow's Feed Conversion Efficiency (kg MS produced per t DM eaten). But, the normal calculations of feed required by TAD cows are likely to overestimate the energy requirement of a OAD cow by up to 5% (because OAD cows spend less time walking and standing on concrete, and more time lying on pastures. Also, they lose less body condition during lactation, and have to regain less condition before calving, a relatively inefficient cycle of loss and subsequent regain of body tissues.).

- OAD cows generally do produce extra milk in response to extra feed, especially if their initial intake of ME had been limiting production. Their response, expressed as g extra milk per kg extra DM given, is likely to be slightly lower than would normally be expected from TAD cows.

Milk composition;

- Concentrations of fat and protein are usually higher by 0.1% to 0.3%, so that MS % is likely to be higher by 0.3% to 0.5%.
- But the concentration of lactose is usually lower by about 0.2%.
- The concentrations of some minor, but potentially valuable, components are also higher in OAD milk; these include immune globulins and lactoferrin.
- SCC of milk is usually higher in OAD cows than in TAD cows, even in uninfected cows; e.g. by 10,000 to 50,000 in early lactation, and by 50,000 to 100,000 later.

The lactation curve;

- The difference in daily yields between OAD cows and TAD cows is largest at the peak of lactation. For healthy, well-fed cows, peak daily yields of between 1.4 and 1.8 kg MS/cow can be expected from OAD cows, whereas 1.8 to 2.2 kg MS/cow daily can be expected from TAD cows.
- Later in lactation the difference in daily yields between OAD and TAD cows is smaller.
- This effectively "flattens" the lactation curve of OAD cows when compared with TAD cows.

Performance of commercial OAD herds;

- This is illustrated below for 18 OAD farms; note that over a third of these farms were in only their 2nd year of OAD, over a third of the farms are hilly, and 2 farms used irrigation.
- On average, imported feeds supplied 16% of the herds' diets , with some importing no feeds [self contained for feeds] and some importing 30% of feed.

Data for 2010/11; from 18 herds milked OAD full-season (from the North Island OAD Discussion Group; 2011).

	Average value	(Range of values)
Hectares	186	(76 – 450)
Cows	547	(230 -1,600)
Kg MS/cow	293	(240 – 334)
Kg MS/hectare	835	(522 – 1,170)
SCC cells/ml	217,000	(100,000 – 300,000)
Mating; weeks	11	(9 – 13)
Not pregnant, %	8	(4 – 15)
[most used no CIDRs or Inductions]		

Note ; # These average yields for the OAD group were 10 % lower per cow, and 6% lower per hectare, than the average yields for all herds in Taranaki, Manawatu and Wairarapa (325kg MS/cow and 891kg MS/ha; AND the average value for SCC was also lower than the average of 242,000 for these three districts. See Dairy Statistics, LIC/DairyNZ ; 2011).

- Higher yields per cow and per hectare were generally achieved in herds that had been on OAD for 3 or more years, from which the cows unsuited to OAD, had been culled.
- Four members have been on OAD for over 8 years; three in summer dry areas including two without irrigation, and one in a high rainfall area. All these have obviously been profitable in the long term.
- Two members, both in summer dry areas but one with irrigation, changed from TAD to OAD 3 years ago; they are already producing more than 95% of the best levels of production achieved previously on TAD.
- Several new members are milking OAD on large newly-converted, ex-sheep/beef farms. If successful, these farms could be the forerunners of an important industry development.
- The largest OAD farm in NZ, in Canterbury, is in its 8th season on OAD. It is 1,360 hectares, all irrigated, and grazes 5,200 cows, mainly crossbreds. These produce about 350 kg MS/cow and 1,300 kg MS/ha, with excellent fertility, despite using no CIDRs or inductions; the herd experiences few lame cows and few problems with mastitis or SCC (the 3 sub-herds range from 180,000 to 195,000 SCC), although some cases of Black Mastitis have occurred.
- All OAD farmers report reduced stresses and strains, on people and cows, associated with their OAD farming system.
- All OAD farmers report a dramatic decrease in lameness in their herds.

- OAD farmers report that their cows are generally less thin than on TAD, and that therefore it is easier/cheaper to achieve BCS targets at calving on OAD.
- OAD cows cycle sooner after calving, and conceive in a more compact pattern during mating, with fewer cows failing to conceive, with few or no inductions or CIDRs used. This better fertility can enable a lower replacement rate to be used.
- Consequently the calving pattern is more compact, with few late calving cows. The resulting more rapid, early increase in the herd's feed demand may require a delay in the start of mating and calving, or an increase in the supplements fed in early lactation.
- All of these benefits in health and fertility generally resulting in a smaller percentage of cows that must be culled [involuntary culling]. This can enable either a lower replacement rate, or an unchanged replacement rate and more cows and heifers sell for milking. In addition, with a normal mating period, more high BW heifers can be available for sale, with only the very best heifers retained in the OAD herd.

Financial performance of OAD farms;

- As for TAD farms; Profit; $/ha = Kg MS/ha x $ Profit margin / Kg MS *(where profit margin = payout; $/kg MS - costs; $ / kg MS).*
- Even if Kg MS/ha is reduced on OAD by, say 10%, profit/hectare can be maintained at previous levels if profit margin/kg MS is increased by 10%.For example, with a payout of $6.5/kg MS and costs of $4.5/kg MS, this will require a decrease in costs of about $0.2/kg MS [- 4%]; with the 10% decrease in kg MS/ha, this would require a 14% decrease in costs per hectare or per farm.
- This is illustrated by the important data for 2005/06, from 22 farms that had changed to OAD [Anderle and Dalley; in the Proceedings of the OAD milking Conference, 2007]. This showed that after the change, kg MS/ha decreased by 5%, costs/kg MS decreased by 20%, and "profit" increased by 15%. In contrast, a recent Dairybase Benchmark for 20 OAD herds in 2008/09, showed relatively low kg MS/ha, with high costs/kgMS and low profit/ha. Obviously, some OAD farms do succeed in maintaining production and reducing costs, sufficiently well to maintain or even to increase farm profit, but some do not.
- Notes; # most OAD farms have relatively larger incomes from sale of livestock # some OAD farms have avoided the need for considerable extra capital expenditure on

a new, larger milking-shed, by their change to OAD, with in lower debt; # some OAD farms are on hilly, or otherwise difficult farms; in these cases the land will probably of relatively lower value/cost per hectare. Therefore, full assessments of financial performances should include % Returns on Assets.

CONCLUSIONS

- Kg MS per cow and per hectare usually decrease in the first few years on OAD. Subsequently, production levels increase again, after cows that do not suit OAD have been culled.
- Any reduction in Kg MS produced will reduce profit, unless costs are also reduced sufficiently.
- Apart from lower yields of MS initially, and generally slightly higher SCC, all other aspects of performance per cow are improved by OAD (better BCS and fertility; more compact calving; reduced lameness; lower replacement rates possible.)
- All OAD farmers emphasise the value of the reduced stresses experienced in OAD milking systems. These benefit people and cows, including the employment and retention of good staff, and greater longevity of cows. OAD systems produce more MS per unit of work and stress!
- The genetic merit of cows for OAD will improve slowly, as cows that do not suit OAD are culled from the OAD herds, and High BW replacement heifers are included. **But,** at the moment, the High BW sires of these heifers have not been identified or proven specifically in OAD herds; however, the accuracy of the OAD BW is being improved steadily as more data is included from cows milked in OAD herds. This deficiency limits the rate of genetic progress in OAD herds when compared with TAD herds. However, the OAD BW now includes more data from cows milked in OAD herds, enabling increasing its accuracy and reliability to be increased.
- In a historical context, OAD milking can be seen as the next logical change, in a long series of changes in milking methods over the past 100 years. These have simplified milking, often by eliminating unnecessary tasks and have improved output per person and overall farm performance. OAD may defer or eliminate the need for a new larger milking shed, with its considerable capital expenditure