ADF Time & Motion Report

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1.0 Introduction

The Automatic Dipping and Flushing system (ADF) developed by Research Developments and Innovations Ltd (RDI) is designed to both disinfect the teat and sanitise the cluster between cows.

There are many reasons that dairy farmers will decide to invest in technology such as ADF, including expected improvements in herd somatic cell count (SCC), reduction in the new mastitis infection rates and improved efficiency in the milking routine.

Any improvement in the efficiency of the work routine could lead to either a reduction in overall milking time, less stress on the operator or the release of time to concentrate on other essential elements of the routine.

To quantify the potential efficiency gains which can be achieved by fitting ADF, a time and motion study was carried out during October and November 2007.

2.0 Background

Milk quality as measured by SCC, Bactoscan and rates of clinical mastitis are areas of great interest to all dairy farmers. When milk prices are depressed, achieving top bands for SCC and Bactoscan can contribute significantly to the price achieved.

Many of the more lucrative milk contracts available, demand that milk is of a consistently high quality.

Data from the Milk Develpoment Council (Figure 1 & 2) suggests that in England and Wales both Bactoscan and SCC are slowly increasing.

There are numerous possible reasons to explain the deterioration in milk quality although there appears to be general consensus that a national increase in herd size and milk yield combined with less skilled labour, is a significant contributory factor.

These factors combine to ensure that the majority of staff on a dairy farm are more than fully occupied and constantly working to deadlines. This results in many farms compromising on their mastitis control programmes.

Teats are regularly disinfected after milking using vacuum operated teat sprayers.

This technique has evolved as dairy farms look to reduce the time spent on any element of the work routine. While teat spraying may be quicker than teat dipping, most dairy practitioners would recommend that teats should be disinfected after milking by dipping. Dipping should ensure better teat coverage and better penetration of product into the teat canal.

Figure 1 – Bactoscans in England and Wales (MDC Datum)

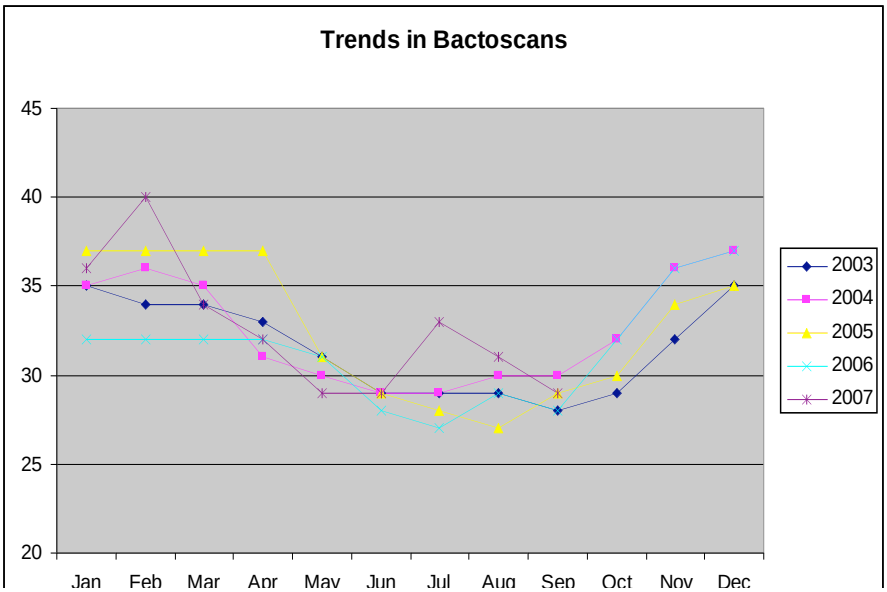
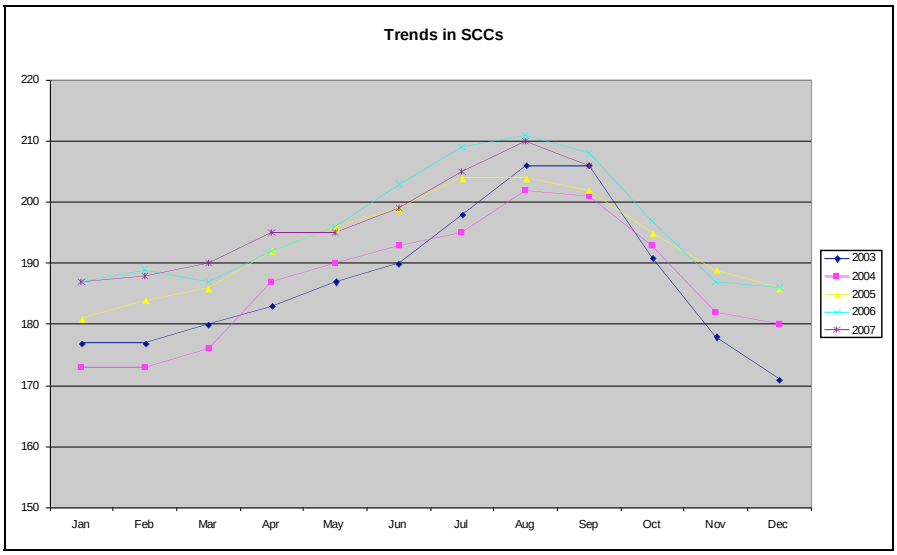


Figure 2 – SCC in England and Wales (MDC Datum)



In an attempt to contain SCC and reduce new infection rates, The Dairy Group consultants are routinely observing manual cluster disinfection in the milking parlour. Some farms disinfect every cluster once it is removed from a cow, while other farms target known problem animals and animals with a SCC over pre-determined levels.

What is clear is that any form of manual cluster disinfection is time consuming, extends the milking and puts additional stress on an already busy operator.

The sum of the individual time elements of the milking routine will ultimately influence the performance of the milking system.

This is illustrated in Figure 3.

Figure 3- Work routine influence on milking system performance

Element	Full Routine (secs)	Minimal Routine (secs)
Load cows	6	6
Teat Preparation	10	2
Foremilk	8	0
Cluster attachment	10	10
Teat dip	8	4
Cows exit	6	6
Miscellaneous time	10	10
Total Time	**58**	**38**
Cows / hr	**62**	**95**

Farms are constantly examining their milking routines to try and streamline the operation and improve performance. However, it is important that this is not at the cost of milk quality and mastitis.

There is great interest amongst dairy farmers in the application of technology to replace labour. If a technological solution can be applied to any task within the milking routine, there is the potential to improve milking system performance.

Clearly the technology must be at least as consistent as the operator which it replaces.

3.0 Time and motion analysis

Milking Technology Specialists from The Dairy Group visited five dairy farms during October and November 2007. The five farms selected included two new ADF installations and three existing users of the technology.

A range of milking systems were selected and these are shown in Figure 4.

Figure 4 – Farms summary

	Farm A	Farm B	Farm C	Farm D	Farm E
Herd size	277	177	254	120	551
Parlour type	24/24 Rapid Exit	24/24 HB	16/32 HB	10 abreast	36/36 Rapid exit
No. of operators	1-2	1	1	1-2	2

Farm A and Farm B were new users of ADF.

Farm A and Farm B were visited for two consecutive milkings before the ADF system was installed. Once the system had been installed and commissioned, another visit was undertaken and two consecutive milkings observed.

Farm C, Farm D and Farm E were already users of the ADF system. These farms were visited for two consecutive milkings where they employed the ADF system as designed. These farms were then asked to disable the ADF system and revert back to their pervious practise prior to installation of ADF.

A full analysis of every operation carried out by the milkers was undertaken and total time associated with each task was calculated.

4.0 Results

Overall milking times for each farm are presented in Figure 5. All values are rounded to the nearest minute for the purpose of the report.

Figure 5 – Overall milking time (mins) with and without ADF

	No ADF(mins)	ADF (mins)	Saving (mins)
Farm A	230	179	51
Farm B	227	133	94
Farm C	229	219	10
Farm D	122	99	23
Farm E	271	198	73

Every farm visited showed a reduction in milking time after the installation of the ADF system.

However, when the data from each farm is examined, it is clear that some of time savings are related to other elements of the milking routine, such as loading the milking parlour and teat preparation.

Figure 5.1 presents the saving in milking time which is directly attributable to automatic dipping of teats and cluster sanitisation.

Figure 5.1 Saving in milking time directly attributable to ADF

	Time saving directly attributable to ADF (mins)
Farm A	25
Farm B	45
Farm C	15
Farm D	17
Farm E	62

A detailed summary of each farm is shown as Figure 5.1 – 5.6.

Figure 5.2 – Summary of Farm A

Activity	**No ADF (mins)**	**ADF (mins)**
Load cows	44	28
Teat Preparation	55	38
Attach cluster	48	47
Teat disinfect	20	0
Sanitise cluster	5	0
Exit cows	8	11
Miscellaneous	50	55
Total	230	179

Of the 51 minutes saved in overall milking time, only 49% was directly associated with post milking teat disinfection and cluster sanitisation. The majority of the remaining saving was associated with quicker loading and faster teat preparation.

Figure 5.3 – Summary of Farm B

Activity	No ADF (mins)	ADF (mins)
Load cows	28	19
Teat Preparation	31	33
Attach cluster	29	25
Teat disinfect	16	0
Sanitise cluster	29	0
Exit cows	18	15
Miscellaneous	76	41
Total	227	133

Of the 94 minutes saved in overall milking time, only 48% was directly associated with post milking teat disinfection and cluster sanitisation. Farm B showed a significant reduction in miscellaneous time which could be associated with a more structured milking routine.

Figure 5.4 – Summary of Farm C

Activity	No ADF (mins)	ADF (mins)
Load cows	21	21
Teat Preparation	53	57
Attach cluster	48	40
Teat disinfect	12	0
Sanitise cluster	3	0
Exit cows	16	17
Miscellaneous	76	84
Total	229	219

This farm showed an overall reduction in milking time of 10 minutes. This farm was very particular when it came to washing off clusters and spent 39 minutes washing clusters during milking before ADF was fitted and 42 minutes washing clusters after ADF was fitted. Although 15 minutes were saved by automating the dipping and spraying, overall milking time was only reduced by 10 minutes as a result of more exhaustive cluster cleaning.

Figure 5.5 – Summary of Farm D

Activity	No ADF (mins)	ADF (mins)
Load cows	7	9
Teat Preparation	29	25
Attach cluster	26	28
Teat disinfect	17	0
Sanitise cluster	0	0
Exit cows	13	14
Miscellaneous	30	23
Total	122	99

Of the 23 minutes saved in overall milking time, 74% was associated with teat disinfection. Clusters were not routinely sanitised before ADF was fitted.

Figure 5.6 – Summary of Farm E

Activity	No ADF (mins)	ADF (mins)
Load cows	37	38
Teat Preparation	61	62
Attach cluster	42	41
Teat disinfect	29	0
Sanitise cluster	33	0
Exit cows	10	12
Miscellaneous	59	45
Total	271	198

Of the 73 minutes saved in overall milking time, 85% was associated with teat disinfection and cluster sanitisation.

5.0 Discussion

Of the farms visited, each farm showed a reduction in milking time following the installation of the ADF system.

The potential saving in time obtained on Farm C was markedly less than on other visited farms as the operator choose to spend additional time washing the external cluster surfaces.

Farm A, Farm B, Farm C and Farm D all showed considerable reduction in overall milking time.

The most significant gain from fitting ADF was obtained by Farm B. Before ADF was installed, this farm was routinely disinfecting every cluster manually after each cow. Farm B gained significantly from automating this process. There was an immediate gain from not having to undertake the task and a secondary gain from the reduced disruption of the milking routine.

Farm A and Farm D carried out the majority of the milking with one operator with some assistance from a second operator at various times. Farm E employed two milkers at all times while Farm B and Farm C employed one operator.

In Farm A and Farm B, between 48 – 49% of the overall reduction in milking time was directly attributable to the automation of teat dipping and cluster flushing. The remaining savings in time were attributed to faster cow loading and a reduction in miscellaneous time.

It was apparent when ADF milkings were monitored, the milking routine was more structured and less erratic. The automation of certain elements of the milking routine potentially releases time for the operator to assist cow loading and adopt a more structured, more efficient milking routine. This may, in part, explain why there were reductions in overall milking time beyond that directly associated with dipping teats and sanitising clusters.

To quantify the labour saving from fitting ADF, an hourly labour charge of £10/hr has been used. For the purpose of this calculation, it is assumed that Farm A and Farm D use 1.3 labour units per milking, Farm B and Farm C use 1.0 labour unit per milking and Farm E uses 2.0 labour units per milking.

The potential annual labour saving from reducing overall milking times can be seen in Figure 6.

Figure 6 – Potential annual labour saving

Potential annual labour saving					£10	per hour	
Farm	Herd size	Time saved	Labour units	Minutes/day	£/day	£/year	£/cow/year
A	277	51	1.3	132.6	22.1	8067	29
B	177	94	1.0	188	31.3	11437	65
C	254	10	1.0	20	3.3	1217	5
D	120	23	1.3	60	10.0	3638	30
E	551	73	2.0	292	48.7	17763	32

The labour saving which can be directly attributed to ADF is shown in Figure 7.

Figure 7 – Labour saving directly attributable to ADF

Labour saving directly attributable to ADF					£10	per hour	
Farm	Herd size	Time saved	Labour units	Minutes/day	£/day	£/year	£/cow/year
A	277	25	1.3	65	10.8	3954	14
B	177	45	1.0	90	15.0	5475	31
C	254	15	1.0	30	5.0	1825	7
D	120	17	1.3	44	7.4	2689	22
E	551	62	2.0	248	41.3	15087	27

6.0 Conclusions

The five farms monitored all showed a reduction in overall milking time following the installation of the ADF system.

When the reduction in milking time is considered, there is the potential to reduce labour costs.

There are reductions in overall milking time beyond that which would be expected directly by automating teat dipping and cluster flushing. It is suggested that some of the additional labour saving is obtained by a more structured and organised milking routine which is achieved following the automation of key components.