



Rumination Monitoring White Paper

Introduction

Rumination is a proven direct indicator of cow wellbeing and health. As such, dairy producers, veterinarians, and nutritionists alike have long relied on cud chewing as a key indicator of dairy cow health.

One of the primary purposes of rumination is to physically break down coarse material in food, in order to assist in its transfer from the rumen. An additional function is to increase the production of saliva, which acts as a buffer to the acids produced during the microbial degradation of carbohydrates. Dairy cows ruminate between 8-9 hours a day (Adin 2009, Byskov 2015). A drop in rumination time can be a result of low feed intake or a direct disruption of rumen function.

Optimizing herd health, fertility, nutrition, and general management is the key to farm profitability – and in all these areas rumination can contribute useful information. Rumination monitoring can provide an early window for disease diagnosis, assessment of recovery and treatment effectiveness (Soriani 2015, Calamari 2014, Liboreiro 2016) or diagnosis of feed related issues.

This document describes the advantages of rumination monitoring with SCR's management systems on the individual cow, group, and herd level.

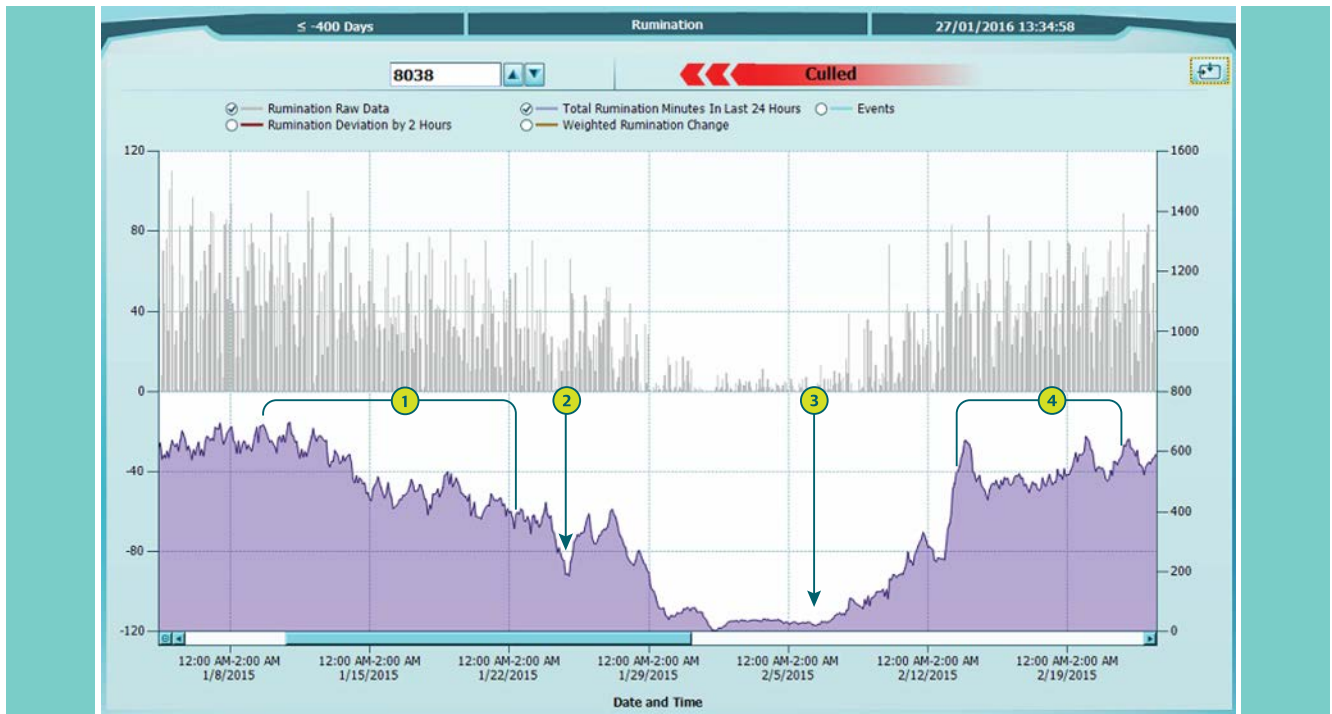


Health Monitoring Using Rumination Time

Early detection of disease:

Early detection and prompt treatment of sick cows can minimize the detrimental effects on their production, reproduction, and overall wellbeing. Research shows that using SCR's **Health Report** (that is based largely on rumination pattern analysis) enables the detection of disease days before it is apparent to the dairy farmer (Stangaffero 2016).

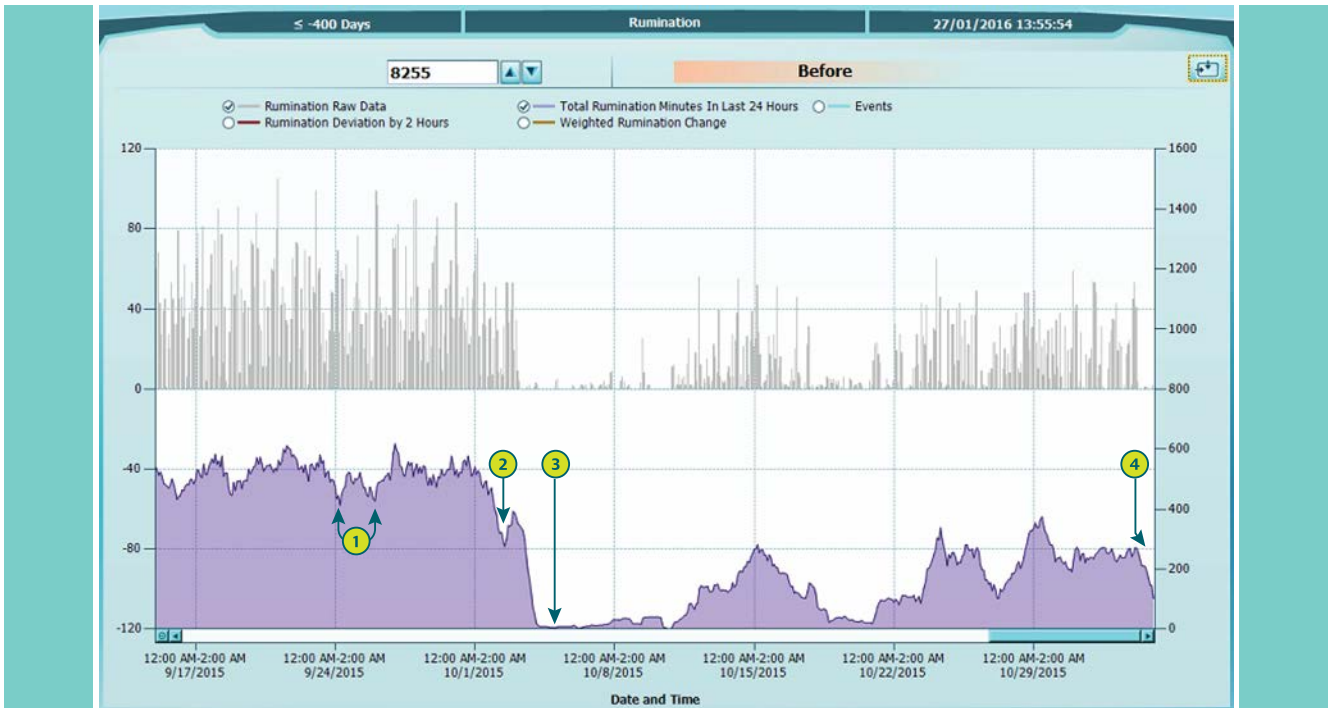
An example of a cow with mastitis is shown below. Rumination started to drop long before the farmer detected it in the milking parlor.



- 1 Cow slowly starts dropping in rumination before milk yield drops
- 2 1/25/15 Cow diagnosed with clinical mastitis and treated with antibiotics
- 3 2/8/15 Cow starts recovering
- 4 2/24/15 Cow returns to normal levels of rumination

Easy recovery follow up

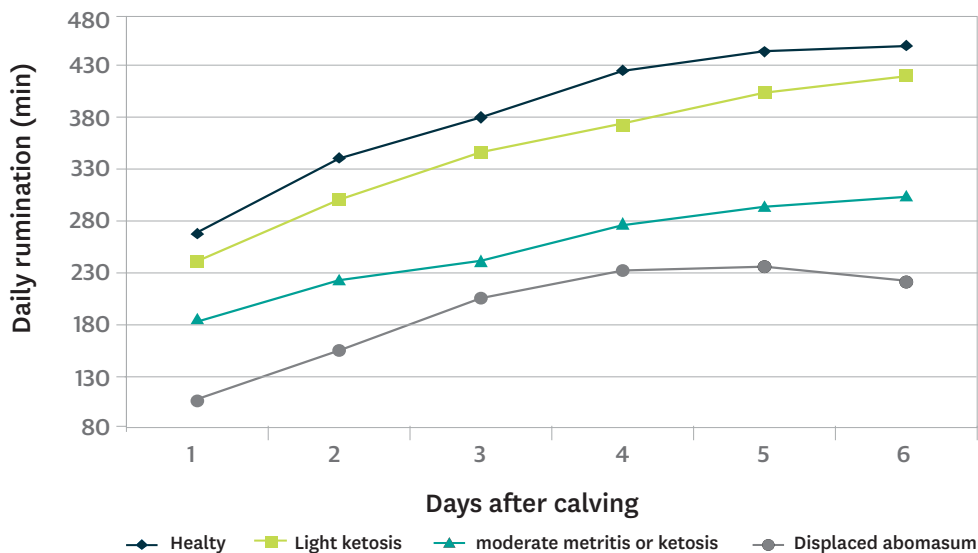
Rumination is essential for the cow. As such, her rumination will return to normal levels before her production level returns to normal. This means that rumination monitoring provides a more immediate way to evaluate the effectiveness of treatment. An example of a cow with clinical mastitis is given below. After the cow was treated, rumination started rising. Notice how the recovery in this case is poor, indicated by the uneven and low level of rumination.



- 1 9.26.15 and 9.27.15 Cow appears in the Health report
- 2 10/3/15 Cow appears in the Health Report
- 3 10/4/15 Cow found recumbent; farmer treats cow for toxic clinical mastitis with antibiotics
- 4 Cow culled due to insufficient treatment

Fresh cow monitoring

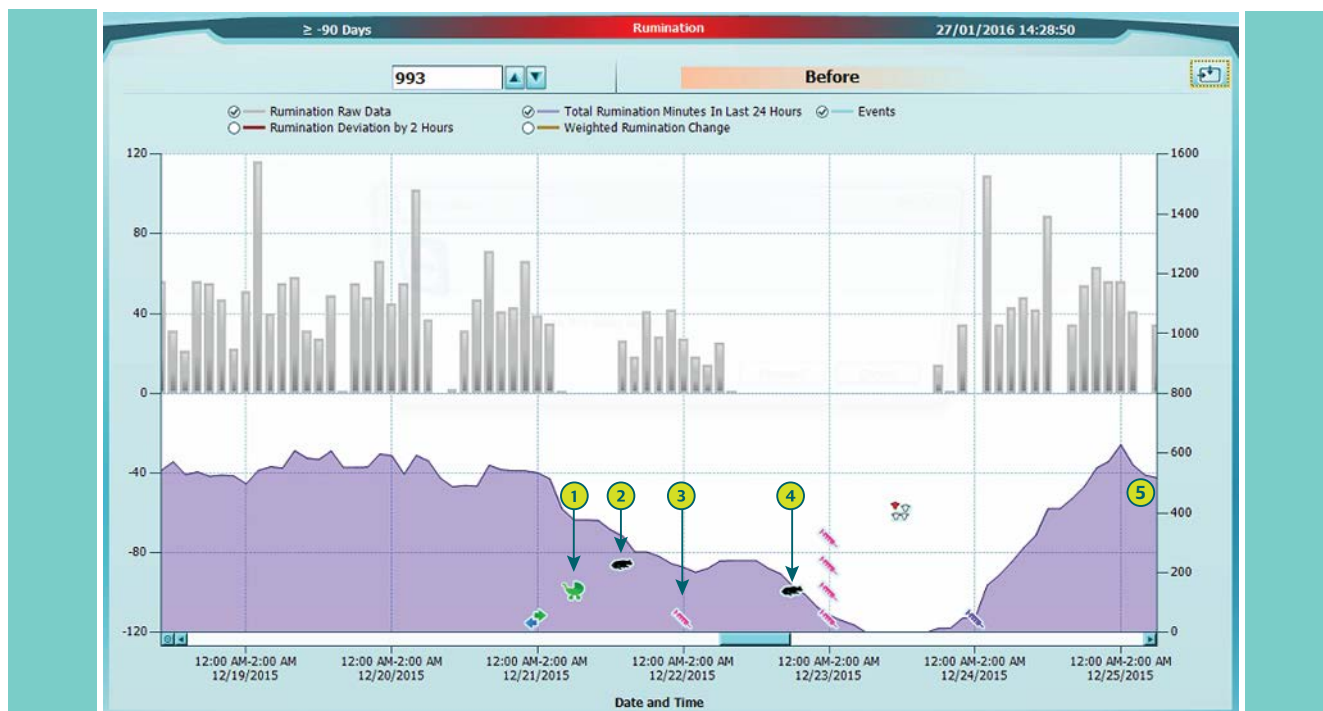
The cow's wellbeing in the first days after calving dictates the fate of her health and productivity for the entire lactation. Cows with low feed intake in these critical days will suffer from various calving diseases (such as metritis and ketosis) later on, with a detrimental effect on future production and reproduction (Calamari 2014, Soriani 2015, Liboreiro 2016). The next graph shows the daily rumination time of healthy and (later diagnosed) sick cows in the first week after calving. Cows with low rumination levels in this period appear on the SCR's Health Report, enabling the farmer to concentrate on these cows and properly respond before clinical diseases develop.



Real-time alerts in distress situations

Cows ruminate in numerous sessions throughout the day. A pause in rumination of a few hours is a rare situation. If a cow stops ruminating for a long period of time, she is probably suffering from an acute situation that requires the farmer to react immediately, before fatal consequences occur.

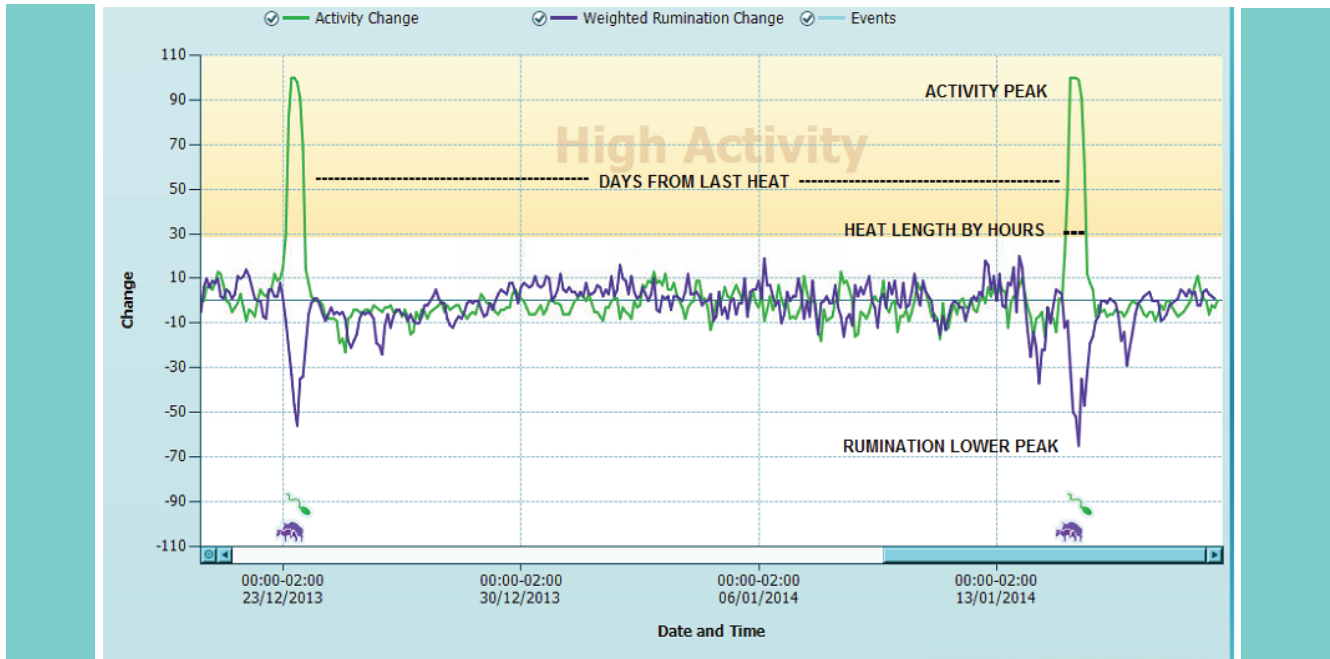
In order to protect the cow's wellbeing, SCR's system sends a distress alert to the farmer, as soon as distress occurs. The next figure shows the rumination pattern of a cow suffering from milk fever after calving, and the relevant alerts noted by the system.



- 1 12/21/15. 6:30 AM Cow calved; delivered twins
- 2 12/21/15 2:00 PM Post-Calving distress alert was sent to the farmer
- 3 12/ 22/ 15 Cow treated for fever and retained fetal membranes
- 4 12/23/15 Second Post-Calving distress alert sent; cow needed more attention
- 5 Cow recovers

Heat detection

The vast majority of cows in estrus will drop in their rumination level (Stangaffero 2016). SCR's Heat Index uses this rumination information in the calculation of the cow's individual heat index, thus increasing the efficiency of heat detection based on activity levels alone. The next figure displays the typical relation between rumination and activity on the day of estrus.



Nutrition

The trigger for the cow to start ruminating is rumen fill. The part of the feed that contributes to the rumination process is the long fiber part of the ration (Mertents 1997). During the rumination process the long fiber of the ration is broken down, enabling the rumen bacteria to digest the fiber. Rumination time is proportional to the amount of long fiber that the cow has eaten. Cows will ruminate about 140 minutes per 1 kg of long fiber consumed. As such, changes in ration content and/or the ration's physical characteristics will be reflected in rumination time changes (Adin 2009).

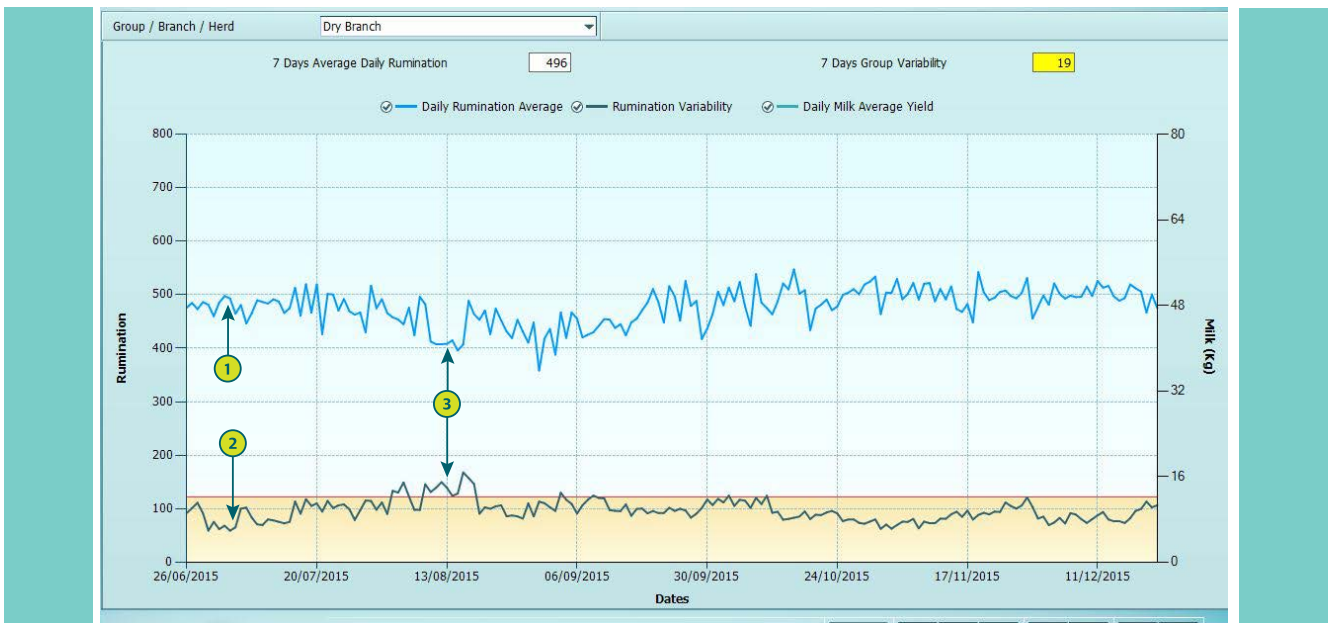
In a typical dairy, feed and feeding management is usually very consistent. When a steady feeding schedule is maintained, one can expect a consistent rumination level on the group/herd level. Once a constant level of rumination is established, any exceptions will indicate that there is a problem either with the ration itself, or with the feed management on the farm.

Daily rumination time of less than 400 minutes per day is considered low rumination, and is a major indicator/risk factor for rumen acidosis, due to less saliva production and insufficient rumen buffer (DeVries 2009). Rumen acidosis seriously impairs cow's health, welfare and farmer income.

SCR's **Group Consistency graph** gives the farmer an easy way to monitor feed consistency and identify deficiencies in feed bunk space, water trough space, or laying down opportunities due to overstocking. Using SCR's system, farmers can monitor not only milking cows, but also dry cows and replacement heifers.

In addition to monitoring rumination trends in both the short and long-term through the graph, the calculated **Last Week group standard deviation** is a useful performance indicator for optimizing feed efficiency. Lower variability values reflect more stable rumen flora, which is essential for optimal nutrient digestibility.

In the graph below, the group rumination standard deviation (the lower line) reflects how variable the cows are in their daily rumination. Biological rumination standard deviation is typically between 50-80 minutes/day. Whenever one of the resources (like feed bunk space) is less than optimal, some cows (those that are lower ranked) will not adequately eat, drink or lay down, causing the variability to increase substantially, as seen below in the beginning of August.



- 1 Group rumination average
- 2 Within the norms of group rumination variability
- 3 Group overstocking caused both a drop in group rumination and high variability in the group.

Management

Keeping a consistent schedule on the farm is essential for optimizing feed efficiency and cows' wellbeing.

For example, late feeding can cause rumen acidosis even with an apparently balanced ration (because hungry cows will consume more concentrate in the same eating session). SCR's Routine Monitoring report enables the farmer to track the farm's routine in real time, and be alerted when a large deviation from the norm is detected (for example in case of cow theft).

The next figure displays the normal farm rumination routine. On this day, feed was delivered two hours earlier than usual, causing more cows to be at the feed bunk, instead of ruminating, between 6:30 AM and 8:30 AM.



- 1 Current group rumination
- 2 Group rumination average of the previous weeks
- 3 Notice the drop in group rumination due to the change in the feed's delivery time

Bibliography:

- Adin, G., R. Solomon, R. M. Nikbachat, A. Zenou, E. Yosef, A. Brosh, A. Shabtay, S. J. Mabweesh, I. Halachmi, and J. Miron. 2009. Effect of feeding cows in early lactation with diets differing in roughage-neutral detergent fiber content on intake behavior, rumination, and milk production. *J. Dairy Sci.* 92:3364-3373
- Byskov, M. V., E. Nadeau, B. E. O. Johansson, and P. Nørgaard. 2015. Variations in automatically recorded rumination time as explained by variations in intake of dietary fractions and milk production, and between-cow variation. *J. Dairy Sci.* 98:3926-3937.
- Calamari, L., N. Soriani, G. Panella, F. Petrera, A. Minuti, and E. Trevisi. 2014. Rumination time around calving: an early signal to detect cows at greater risk of disease. *J. Dairy Sci.* 97:1-13.
- DeVries, T. J., K. A. Beauchemin, F. Dohme, and K. S. Schwartzkopf-Genswein. 2009. Repeated ruminal acidosis challenges in lactating dairy cows at high and low risk for developing acidosis: Feeding, ruminating, and lying behavior. *J. Dairy Sci.* 92 :5067-5078.
- Kaufman, E.I., S. J. LeBlanc, B. W. McBride, T. F. Duffield, and T. J. DeVries. 2016. Association of rumination time with subclinical ketosis in transition dairy cows. *J. Dairy Sci.* 99:5604-5618.
- Liboreiro, D. N., K. S. Machado, P. R. B. Silva, M. M. Maturana, T. K. Nishimura, A. P. Brandao, M. I. Endres, and R. C. Chebel. 2015. Characterization of peripartum rumination and activity of cows diagnosed with metabolic and uterine diseases. *J. Dairy Sci.* 98: 6812-6827.
- Mertens, D. R. 1997. Creating a system for meeting the fiber requirements of dairy cows. *J. Dairy Sci.* 80:1463-1481.
- Pahl, C., E. Hartung, K. Mahlkow-Nerge, and A. Haeussermann. 2015. Feeding characteristics and rumination time of dairy cows around estrus. *J. Dairy Sci.* 98:148-154.
- Stangaferro, M. L., R. Wijma, L. S. Caixeta, M. A. Al-Abri, and J. O. Giordano. 2016. Use of rumination and activity monitoring for the identification of dairy cows with health disorders: Part I. Metabolic and digestive disorders. *J. Dairy Sci.* 99:1-16.
- Soriani, N., E. Trevisi, and L. Calamari. 2012. Relationships between rumination time, metabolic conditions and health status in dairy cows during the transition period. *J. Anim. Sci.* 90:4544-4554.
- Sova, A. D., S. J. LeBlanc, B. W. McBride, and T. J. DeVries. 2014. Accuracy and precision of total mixed rations fed on commercial dairy farms. *J. Dairy Sci.* 97 :562-571.

SCR. Make every cow count

SCR Headquarters

18 Hamelacha St.
4250440, Netanya, Israel
info@scrdairy.com
T: +972 (0)73 2406000
F: +972 (0)73 2466155

SCR Europe

Via Mattei 2, Loc-Gariga
29027 Podenzano (PC), Italy
screurope@scrdairy.com
Tel: +39 0523 1867200
Fax: +39 0523 1867299

SCR China

Guanghua SOHO2 A10-8
(9 Guanghua Road, Chaoyang district,
Beijing China, Post code:100020)
info@scrdairy.com
Tel: 010-87605808 Ext:807(sales)
Fax: 010-87606808

SCR North America

2013 South Stoughton Rd.
Madison, WI 53716, USA
NAmerica@scrdairy.com
Tel: +608 237 3170/1/2
Fax: + 608 237 3173

SCR Brazil

Rua Dona Francisca
8300 Joinville SC – CEP 89.239-270
contato@allflex.com.br
Tel: +47 55 3451 0500 / 0800 6457776
Fax: +47 55 3451 0524

SCR UK&I

Allflex UK Group Ltd,
1 Greencroft Business Park,
Stanley
Co. Durham
DH9 7YA
ukenquiries@scrdairy.com
Tel: +44 7876 889917

www.scrdairy.com | info@scrdairy.com

Copyright© 2016 SCR Engineers Ltd. The information contained herein is subject to change without notice. The only warranties for SCR's products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. SCR shall not be liable for technical or editorial errors or omissions contained herein.

Rum_8_A4_Eng_July16