






Building Our Future: Robotic Milking systems  
performance and efficiency

## Labour efficiency in AMS Barns

January 28, 2019  
4dBarn Oy  
Jouni Pitkäranta



Boost  Design  Ventilat  Invest 

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### Robot barn research

- During 2014-2015 44 barns investigated
  - 1-8 robots
  - Different brands (Lely, deLaval, GEA, Sac, Merlin)
  - Finland, Åland Islands, Sweden, Denmark, Holland, United States
- Measuring working time during morning tasks
  - Also about 60 separate questions, "data of the day"
- Self payed
- Help from Dairylogix (Canada) Wi University (US) and Dronen Ag University (Holland)

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### We have measured:

- Labour time in different places (1 minute accuracy)
- Steps with pedometer
- Neck rail position in stalls
- Amount of bedding
- Amount of light
- Air speed in different places
- Observations in general

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### Questionary:

- 70 questions after timing morning tasks
- Questions about production numbers and daily / weekly / monthly routines
- Farmers own analysis of good and bad things in the barn
- In some farms timelapse videotaping



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### Goals:

- As a barn designer to understand how a robot barn works in practice
- To find development areas and factors between labour efficiency, costs and production
- To find things in the barn which are actually not needed
- To give ideas to survey farms to "finetune" production and facilities
- **Later to develop a complete new method to do functional design**

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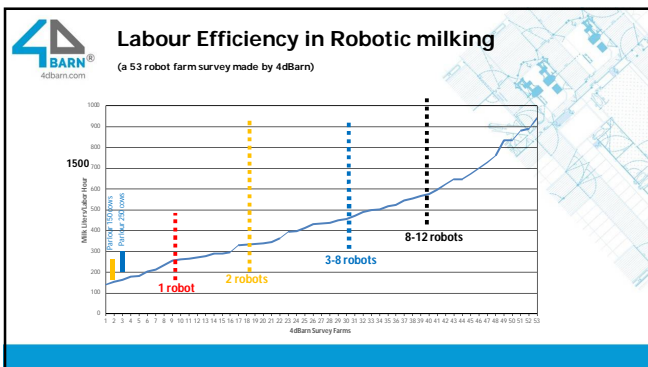
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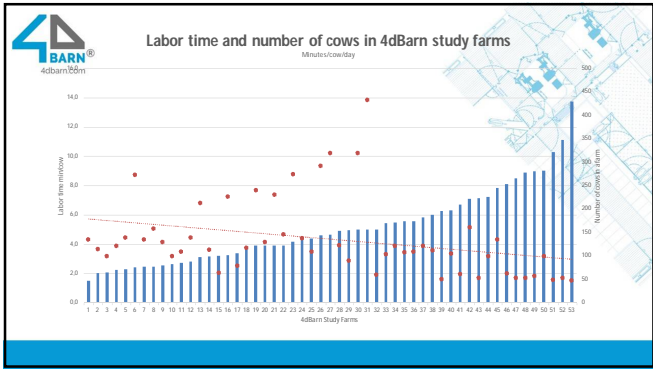
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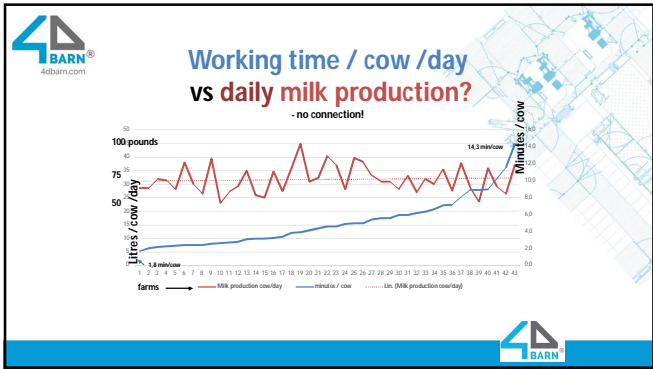
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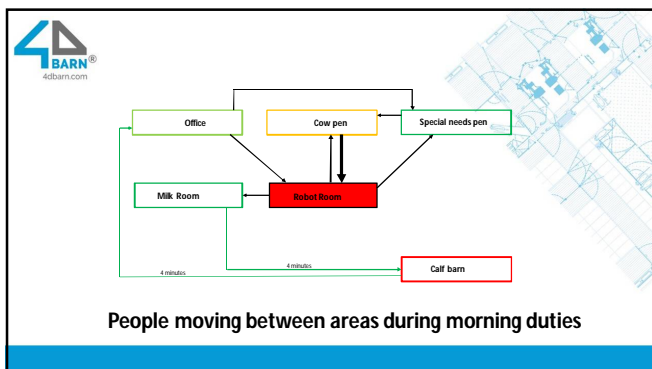
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**Using LEAN-concept to analyze barn's functionality and production processes,**  
**Avoid:**

1. Transport (logistic design, where to locate different working areas)
2. Inventory (calving interval, lots of calvings in short period)
3. Idle time (timing, feeding / Cleaning robot / stalls in wrong time, waste-waiting)
4. Over production (for example too much heifers)
5. Over Processing (over cleaning floors, robots)
6. Bad quality (waste milk, waste feed)
7. Operation motion (handling and robotroom area design and equipment, right tools in right place)

**THIS IS WHY WE START BARN DESIGN BY PLANNING THE ROUTINES**

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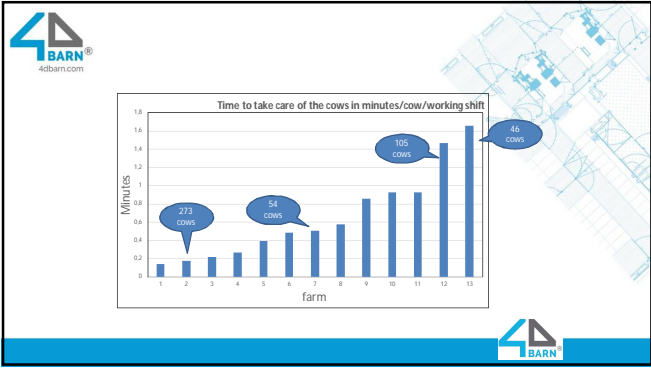
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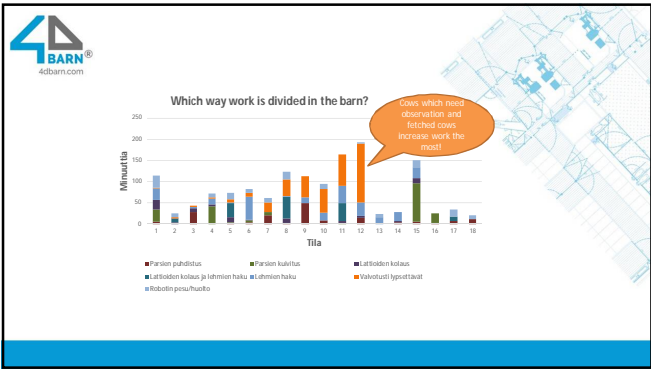
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### Time used in feeding



Two batch  
for 300 cows  
- 1 hour 15  
minutes



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### Time used with calves





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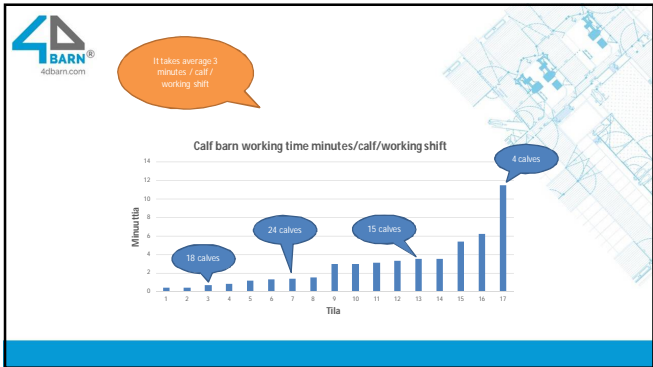
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### Are robots only for the small farms?



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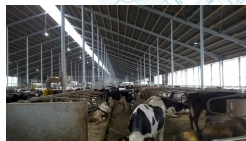
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### ADSA Book Chapter 2016

- **Automatic milking in large dairy herds (2016)**
  - Authors Jouni Pitkäranta and Jack Rodenburg
  - Included a mini survey and visits to farms



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### Farms in a survey

- The 9 large robot farms located in Denmark (5), Germany (1), Canada (1) and United States(2)
- milked with Lely (5 farms) and DeLaval VMS robots ( 4 farms).
- These herds milked 360 to 1100 cows (average 644), with 7 to 22 milking boxes (average 12).
- The number of cows per robot ranged from 40 – 63 and averaged 54.5.

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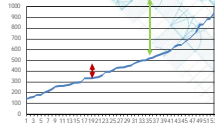
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### Labour Efficiency in surveyed large herds

- Minutes / cow from 2.1 to 4.9 minutes (average 3.6 minutes)
- Litres / labour hour from 502 to 1060 litres (average 640 litres).
- Typically farms in US with 600 – 1000 cows milked in a parlor litres / labour hour can be 350-450 litres.



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### Labour efficiency thoughts in large robot barns

- More things are being done as daily basis compared to small barns
- More groups -> time used to move animals / change groups
- Distances increase -> more time goes to non-productive walking
- More employees – more full day shifts -> difficult to fill all day to efficient productive work
- Farmers (owners) are ok with shorter days in smaller farms and might also do tasks faster
- **Consistency and ability to stay in a barn enables higher production in large barns**

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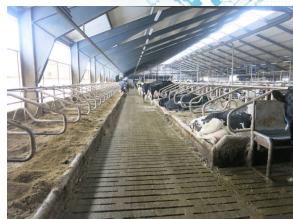
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### Most labour efficient farm in a survey:

- 9 AMS units
- In Denmark
- Average 38 litres (84 pounds)
- 21 000 litres milk / day (46 000 pounds)
- 19,5 labour hours / day
- **1060 litres of milk / labour hour (2330 pounds)**



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### Future thoughts:

- When robots become more popular, shared employees / private maintenance persons between farms?
- Small family robot farms create more income working part time in large robot farms?
- Satellite production units in different locations with shared special needs unit

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### Key factors to achieve labour efficiency

- Cow comfort!!!
- Not too many cows / AMS unit
- Right gating to fit to working routines
- Well working handling area
- Right type of lay-out and robot orientation

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### Gating!

- In addition to "catalogue" gates, robot barn needs lots of special custom made gates
- Instead of moving all group in robot barn individual cows or small groups are moved
- Gating slightly increases cost but saves a lot of labour!
- Gate design is a very important phase in a design process
- Gates are just steel, not rocket science

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**4BARN** An example 240 cows, av. 90 pounds (41 litres)

- A farm using 3,5 minutes / cow -> 14 labour hours
- A farm using 6 minutes / cow -> 24 labour hours
- Difference 10 hours / day
- 10 hours x 140 usd -> 140 usd / day -> **51 000 usd / year**  
-> **766 000 usd** in 15 years

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Time is money!




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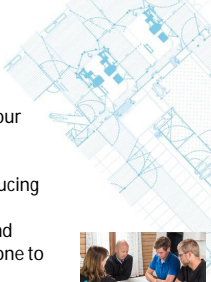
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### Why 4dBarn?

Because we

- design barns with primary goals on labour efficiency and cow comfort
- are an independent company
- have a good understanding about producing high quality milk with robots
- after the project is ready, we analyse and measure the barn and design the next one to be even better

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A barn is a tool for making milk. With us You will get the kind of tool that fits Your goals, way of working and management style.

[www.4dbarn.com](http://www.4dbarn.com)



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## Robotic milking and labour efficiency

We have visited and recorded labor times over 50 robotic barns in North America and Europe. Our data shows that having a robot in your barn doesn't automatically mean your barn is labor efficient or gives you the production level you have set your goals to.

Robot is a machine for harvesting milk, but the milk is made in a barn around it.

It is all about the barn design and management around it!



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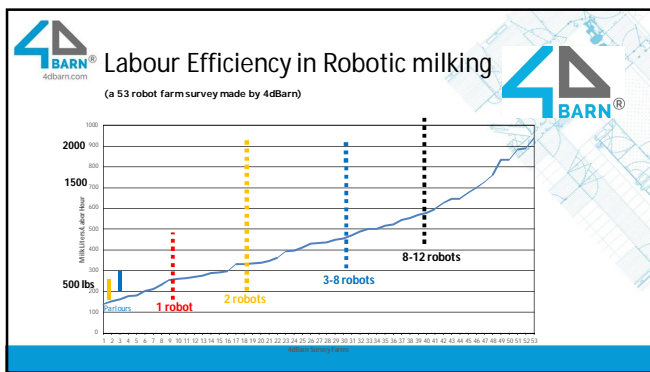
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## Barn Design process

- Big Picture
  - Farmstead plan
- Concept
  - Feeding table location
  - Number of rows
  - Manure system
  - Ventilation system
- Functionality
- Construction design



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## Design process and economy

- Big Picture (Farmstead plan) gives Your farm a longer lifespan
  - Avoids sidesteps
  - When thinking expansion, always look ahead one or two steps
- Concept determines barn's investment cost
- Functional design determines barn's operation cost
  - Labour efficiency but also a big part of cow's performance
- Construction design just puts this all together

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## In which phase of design process we can help the customer the best way?

- As early as possible...
- When a farm has made a preliminary decision to build
- Has talked with a bank
- Even before making a decision about robot brand
- Changing the way of thinking from "I like that layout" to "How I'd like to work in my barn"



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## Working together in design phase

### The Farm Adviser

- Adviser knows the farm and its strengths and has deep understanding about the management style of the farm
- Get her/him into the design process not just commenting drawings

### The Dealer

- Dealer has the best knowledge about the machinery and its requirements
- It's also dealers benefit the more functional barn is

Farmer gets the best barn when we all work closely together



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## The Farmer and 4dBarn

- The process:
  - Increase understanding of a farmer what kind of working place She / He is building
  - Committing the farmer to decisions made in a design process – not changing mind (feeding, ventilation, grouping...)
- The end result
  - Farmer has a right tool for producing milk with high labour efficiency and cow comfort



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## 4dBarn Farmer's Stories

"We chose to collaborate with 4dBarn because we had heard about the positive experiences of their other customers. Hearing those stories built trust in the company. Their team is specialized in functional barn design, which was what we needed. In addition, our hopes were taken into account in the design process."

Anders Johansson and Sonja Ek-Johansson  
Parainen



"We used 4dBarn's design services. Communicating with 4dBarn has been easy and we have been able to ponder together questions that have arisen after the barn was taken into use. In our opinion, the company has a lot to offer for ranches both in Finland and abroad. We believe 4dBarn's services are quite unique in the world."

Janne and Paula Kokkonen  
Siilinjärvi



www.4dbarn.com

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## What thoughts / differences we see in AMS barn design in United States?

- Price of AMS unit significantly higher in US
  - Why? Why? Why?
- Housing barn price / square foot a lot higher in robot barns than with parlor
  - With AMS barn will have a lot of other automation
  - Does it need to be so?
- Robot brand chosen before lay-out
  - All three main robot brands fit pretty much to same lay-out
- Tighter economy pushes to maximize robot capacity
  - But then a high risk to labour efficiency and production / cow to go down...



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Thank You!



We will make it happen.



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