More Cows, More Milk and Less Farmers
Patrick Crannell

As North America’s dairy cow population has been rising, the number of people who manage this growing population has declined.

It’s a classic inverse relationship that is chock-full with discussion points. Another trend seen in the dairy industry is that milk production has increased. In 1975, annual production was around 115 billion pounds and in 2000 annual production was 167.7 billion pounds. In Michigan alone, 4,411 million pounds were produced in 1975, and in 2000 that number increased to 5,705 million pounds.

The ingredients to the modern dairy farm are the following: more cows, more milk and fewer humans managing the cows, including milking the cows.
In a general sense, milking cows went from the classic bucket and pail approach to the innovative milking parlor with its abundance of nuances and efficiencies. While the methods and technology of milking have changed, what did not change was the need for someone to physically attach the milking device to the cow, until now. It is not uncommon for dairy farms to adopt the latest milking technology known as automatic milking systems, colloquially known as robots. They are not robots that conjure up images of the skeletal steel framework of the Terminator, but are instead sophisticated units that will milk a cow one at a time while generating a wealth of information on that individual cow. From the cow’s side, they look something like this:

![Cow in milking parlor](image1)

And when the cow is getting milked, it looks like this:

![Cow being milked](image2)

And from the human side, it looks like this:
What’s the benefit of robotically milking cows versus traditionally with humans? The robots will show up to work; whether or not they decide to work properly is another issue. Dairy farms struggle with hiring workers, especially people who will milk cows. Many dairy farms rely on foreign workers to do the job that no one else wants to do; similar to the robots, is another issue rife with hurdles. The robots are special though. One of the unique capabilities of these machines is that they generate a lot of data on individual cows such as: milk temperature, milk yield, milk color, milk consistency, milk electroconductivity and many others. It should also be noted that cows want to get milked because when they are in the machine, they are receiving grain. In other words, the cows are incentivized to get milked, but they will be prevented from getting milked and thus eating grain, if they’ve been to the robot to many times that day or have not allowed enough time to pass from their last entrance. The robot knows a lot about the cows, and it will tell the farm, in addition to milk characteristics, how much grain the cow’s eating, how many times the cow has visited the robot or it will even alert the herdsman of cows that need to be “fetched” to get milked.

It sounds like what’s being proposed here is that most cow issues dairy farms encounter can be solved by the robots. That however is far from true. What plagues dairy farms is mastitis, inflammation of the cow’s mammary gland i.e., the udder. Mastitis is a disease that is rampant on all farms and something the robot needs schooling in. On the more traditional farm that has humans milking cows, it is the human who will visually inspect the cow’s milk for abnormalities or the cow herself for physical changes such as a hot udder. On robot farms, the visual inspection and physical examination has now been replaced by sensors that are in the milking tubes. It is the job of these sensors and their preprogrammed criteria for abnormal milk detection that will alert the farmer of a cow with mastic milk.

The robots can detect the more prominent cases with ease. In other words, they are reliable in alerting the farm of the clinical cases, but these cases are simply the tip of the iceberg. What is more problematic on dairy farms are subclinical cases, the type of mastitis that goes unnoticed and cannot be detected by the human eye. Subclinical mastitis is the insidious form of the disease that reduces milk yield and costs the farmers resources as a healthy cow and a subclinical cow will receive the same type of management strategies. Subclinical mastitis on a large scale has tremendous impact on milk quality too. All of the milk that a farm generates is pooled into the same milk tank. If for example 10% of a farms cow had subclinical mastitis, then
all of their “infection” will be pooled together with the other milk and reduce the quality, shelf life and price of that milk.

If production has been increasing, why should we care now about subclinical mastitis? Dairy farms need to become more efficient in order to stay economically viable. If milk prices do not increase, then farmers respond by reducing their costs. Detecting subclinical mastitis would be astronomical for dairy farmers in keeping costs down as detection would prevent production losses, unnecessary and aggressive treatments, such as antibiotics or unwanted culling, and reduced fertility; an ounce of prevention is worth a pound of cure.

The projected world population by 2050 is 9 billion. The agricultural industry is being taxed with an unfair demand to feed the extra 2+ billion people entering the world when help is nowhere to be found. If technology is part of the solution to feeding the world, then that technology ought to help farmers in doing what is best for the farm and the cow. By studying the relationship now between specific milk parameters like electroconductivity or yield and analyzing the milk for bacteria and white blood cell presence, then thresholds can be determined and programmed into the robots. If more sensitive and specific thresholds are found, then cows will be healthy, farmers will stay afloat, and humans will remain nourished.