



Hay In a Day?

Preliminary Results of PAMI's Hay Macerator Project

PAMI has received considerable publicity recently about its Hay Macerator project. Many articles have appeared in the farm media, and PAMI has fielded many questions from farmers about this machine.

The hay macerator is a prototype only at this stage, and will require ongoing changes to achieve a favourable design. The project will be completed by 1996.

Hay Maceration- What is it?

The idea of hay conditioning has been around since the 1950's, when the first mower conditioner was conceptualized, but the concept of hay maceration came out of Europe in the late 1970's.

Maceration, (also sometimes called super conditioning), is the process that shreds stems of forage crops and presses all the material into a thin mat. This mat is then deposited onto the cut stubble for natural air drying. It differs from traditional crop conditioning in several ways:

- The windrow is wider and therefore thinner, allowing crop to dry down much more quickly.
- Macerating hay is more aggressive to the crop than traditional conditioning or crimping.
- Livestock perform better when fed macerated hay.
- Macerated hay exposes more plant sugars. Resulting silage ferments faster and more completely, making a

better end product.

In the mid-1980's PAMI began following maceration research in North America. Two researchers, Dr. Philippe Savoie from Ag Canada (Quebec) and Dr. Richard Koegal from the University of Wisconsin began building prototype macerators independently, and made some significant improvements in drying rates.

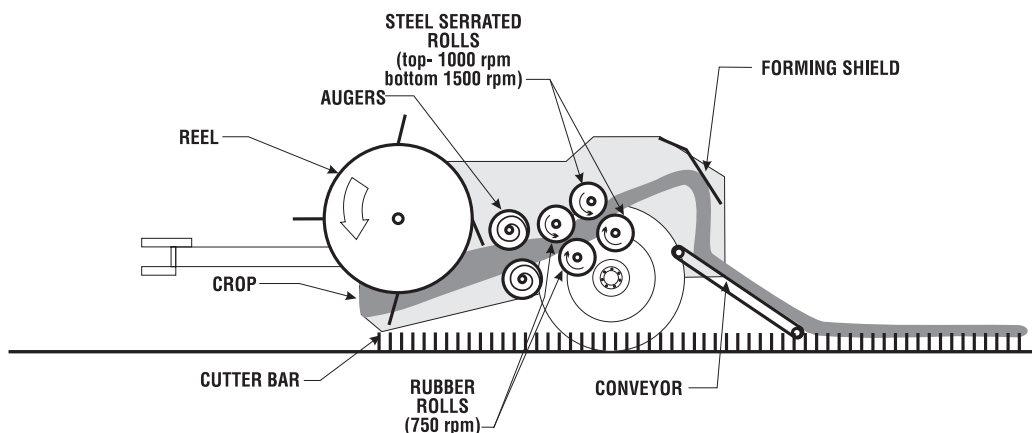
PAMI learned of the research, monitored its progress, and felt the technology could be successfully applied to Western Canadian conditions and crops.

PAMI received funding from Saskatchewan Agriculture and Food (Agriculture Development Fund) and the Manitoba Sustainable Development Innovations Fund (administered by the Manitoba Forage Council) to carry out research on the prairies. PAMI has also contributed funding to the project.

How does it work?

The machine cuts the crop and feeds it through a set of rubber and then metal crimper rollers to impart aggressive shredding and crimping action onto the crop (see drawing below). This shredding and crimping action results in longitudinal splits in the stem, which significantly increase drying rate.

The material is then directed by a forming shield to a conveyor (at a rate that matches ground speed) for gentle delivery onto the cut stubble for natural air drying.



Some Commonly Asked Questions About Hay Maceration

• *Just how fast is the drying time?*

Early indications have shown that silage can be chopped after 3 hours, and hay can be baled after 10-12 hours (18% MC). The University of Saskatchewan compared the macerated crop to traditionally crimped forage and found the drying rate to be twice as fast, regardless of whether the crop was fresh cut or had been re-wetted. The faster drying rate combined with the wider and shallower windrow produced by the macerator enables forages to dry down 4 to 6 times faster than with a crimper.

• *What are the power requirements?*

Power requirements for the macerator have been measured at about 25 to 30 hp (19-22 kW). Mower conditioners tested by PAMI in the past have had power requirements in the range of 10 to 17 hp (7-13 kW).

• *What will rain do to this product?*

Under heavy rainfall, macerated crop tends to spoil faster than conditioned forage in a windrow. Prolonged periods of rain result in a greater degree of surface bleaching and a darkening of green colour. However, as drying times are reduced, weather can be more accurately predicted. Weather forecasts are still important, and tend to be more accurate over a shorter time period. Therefore drying time reduction becomes the critical factor.

• *What will the colour be like?*

Macerated hay is a slightly lighter green than normally conditioned crops. The plant stems are split lengthwise, and this exposes the lighter coloured interior of the stem. (Remember, it's this splitting action that decreases drying time). The overall color is a brighter green because the plant has been exposed to less sun and rain.

• *What will cubes and pellets from macerated hay look like?*

There is a slight change in the color of pellets. However, it is difficult to see, and is not expected to be a problem.

• *What's the potential of macerated hay for the dehy industry?*

A comparison has been done, with a macerator and a traditional mower conditioner cutting crop in the same field at the same time. The durability, protein, and carotene levels of the pellets produced were all very similar for the two machines. However, there was 43.3% saving in gas consumption in order to arrive at the same final moisture content. This translates into a saving of about \$5.90/ton (\$6.50/tonne).

• *What about leaf losses?*

Many things affect leaf losses: crop variety, crop maturity, weather conditions such as humidity and temperature, and machine settings. The macerator is adjustable to control leaf losses. Feed analysis results of macerated hay show that feed values are virtually identical to crops cut with mower conditioners. Achieving low leaf losses in conjunction with high drying rates remains a balancing act; machine operators must find a compromise they can be comfortable with.

• *What is the throughput or capacity of the machine?*

About 4-5 acres per hour (1.6-2 ha/h). Our goal is 5-6 acres per hour (2-2.5 ha/h), about the same as a mower conditioner. Ground speed works out to about 4-5 mph (6-8 kph). PAMI believes the reel and cutterbar are limiting the capacity of the machine, since this is where plugging occurs at higher field speeds.

• *What is the cut width?*

As this is a research machine, we wanted something that could be easily transported to demonstration sites, so we restricted the cut width to nine feet.

• *How much will it cost, and when will I be able to buy a macerator?*

The best estimate we can give is based on the complexity and number of parts in the prototype. We don't expect it to be significantly greater than the current cost of a traditional mower conditioner (perhaps 10% more). Exactly when it becomes commercially available will depend on manufacturer's plans and schedules.

The Future

There are currently two manufacturers in North America building and/or testing prototype superconditioners. A number of smaller manufacturers have expressed an interest in acquiring the maceration technology, and several have had discussions with PAMI regarding an exchange of information. Other researchers are also attempting to sell their versions of this technol-

ogy to manufacturers. We expect rapid future development of this technology, but it is difficult to predict a date when maceration machines may begin appearing on the market. A longer engineering report (RP0195, *Development and Field Research of Hay Maceration Technology*) is available. A small charge may apply.

ACKNOWLEDGEMENTS

The research for this project was carried out with funding from the Sustainable Development Innovations Fund (Manitoba) and the Agricultural Development Fund (Saskatchewan).

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