inventory of available straw processing / straw building equipment

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1 INTRODUCTION

This report will show an inventory of available systems and straw processing equipment for the use of straw as insulation material for retrofitting existing buildings as well as for new buildings.
A wide range of equipment and tools is available. This includes products specifically designed to process straw as well as general tools used for processing straw. With this report we want to give an impression of some installations and tools that are available for processing straw in construction. In this way we want to provide inspiration to translate wishes and ideas into actual application.

2 Straw processing equipment

2.1 Straw bale press (small bales)

To collect and pack the remained straw from the field, after harvesting, several brands have developed equipment fort his task. In general the baling process is identical: straw is pushed, stroke by stroke, into a rectangular tunnel and wrapped with two or more strings, at a pre-set length.

For the use of straw bales in the chosen construction method, it may be important to take into account the actual dimensions of the bales to be used.

Therefore, it is important to know that the different brands and models of bale press machines give small variations in the size of the straw bale.

Part of these dimensions can still be set within certain limits, but part is also determined by the design of the baler used.

The least important dimension is the length of the straw bale. This is determined by the adjustment of the knotting mechanism of the baling machine and can be freely selected within practical limits. In addition, around 90 cm in length is a very practical size. Much greater length gives restrictions in handling and much smaller length gives more loss and more operations.

The height (thickness) of the bale is partly determined by the height of the tunnel through which the straw is pressed into a bale. To control the pressure with which the straw is pressed into the bale, the tunnel of the baling machine has an adjustable narrowing of the tunnel height at the exit. For most press machines, this is the size of 35-36 cm.

The least variable size of the straw bale is the width. This is 1 to 1 related to the width of the tunnel of the press machine. Due to the horizontal transport of the straw to the tunnel entrance there is a preference – orientation of the straw in the width direction of the bale. And when baling in the tunnel, the straw is also cut to the width of the tunnel by the press that pushes the straw into the tunnel. The width direction of the bale is therefore the least compressible direction of the bale. This is in contrast to the longitudinal direction of the bale, which is most compressible.

When using straw bales, it is important to take the bale size into account.

The length of the bale (about 90 cm) has the greatest variation and is therefore almost never taken as a fixed starting point for a design.

Depending on the position of the bale in its application, the thickness of a bale (approximately 35-37 cm) is an important starting point. A lot of straw construction in a timber frame construction is carried out with the bale on the side and thus gives a construction (wall, roof, floor) that is 35-37 cm thick for the straw.

The width of the bale (45-49 cm) is most strongly related to the brand and type of straw baler. It is therefore particularly important for the vertical use of straw bales in a construction to properly coordinate the size of the construction and the size of the bale used.

2.2 Blow in Straw

At this moment there are three production lines for blow in Straw. This is ISO-Stroh from Austria and iStraw from Germany and Sonnenklee from Austria. The first two companies developed a production line to for this type of straw where it is also possible to by a copy of the complete production line to produce your own local blown in straw.

ISTRAW
straw based materials

ETA 22/0233

ISO-STROH

ETA 17/0559

SonnenKlee
Erdig. Menschlich. Gut.

ETA-18/0305

3 Straw Bale processing machines

3.1 Ecostrauv (by Activ Home)

ACTIV HOME has developed a process to manufacture wood walls and floors with straw insulation. It is a patented industrial process (ECOSTRAUV®), using biobased materials with a local production.

3.2 Straw Blocks //systems

This company has developed several machines to change the form of a strawbale (grinding and cutting). These machines are used now to produce prefab straw panels.


STRAW BLOCKS SYSTEMS

4 Strawbale building tools

4.1 Manual tools

straw needle & double needle:

Many straw bale builders use a “needle” or other tools to split a straw bale. The straw needle is a traditional tool to provide a bale with new twines in a different position so that the straw bale can be split.

By using a double needle with two strings through the eye at the tip of the needle, you can re-tie the straw bale at the desired length. This works faster than a single needle.

Clamps:

Straw clamp:

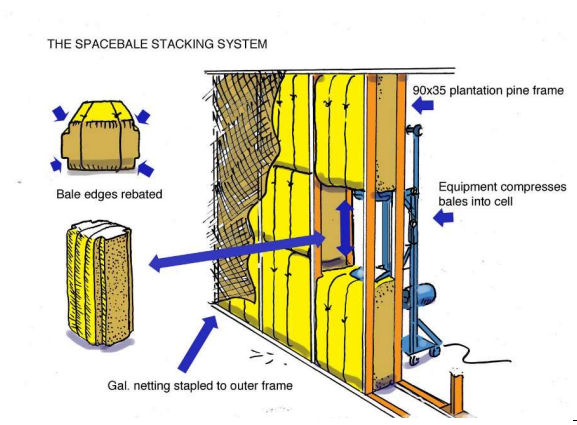

The straw clamp was once invented to carry out many straw building actions. But because of the size, the extra actions and the weight, it is a tool that is mainly useful where the added value is high. When filling in straw bales, the clamp is particularly useful to ensure that the last bale in a filling box fits well. The straw is usually already compressed by then, leaving a final straw bale that should preferably be made as tight as possible.

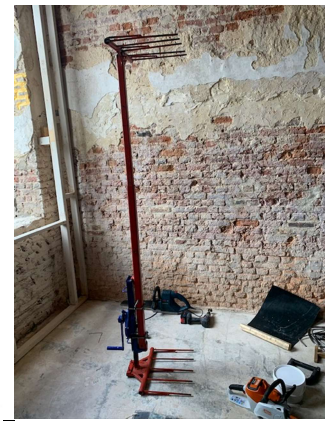
With the straw clamp you can compress part of a bale tightly and you have a good grip to saw this package to fit. You can then tie the straw package together with a lashing strap or bale rope and loosen the clamp.

Glue clamp:

A set of glue clamps can be a handy alternative to the much heavier straw clamp. When using the glue clamp, it is mainly about maintaining the existing compression of the straw during splitting. With the straw clamp you can also increase the compression even more.

Fill-in and compression clamp





Various forms of clamps and compression aids have already been designed to assist in filling bales into an HSB. Most systems are designed to assist in vertically placing the straw bales

Bottle jack:

The bottle jack is often used for the compression of the straw when filling it in a wood construction. There are often additional aids to transfer the force from the jack to the structure. Usually these are angle irons or logs. Most bottle jacks can only be used vertically because of the oil supply.

Hammer and Fork:


Especially when placing the last straw bales, it may be necessary to exert some extra force with a hammer. If possible it is better to use the side of the hammer. This results in less deformation of the straw bale itself.

And before you start compressing, it is also useful to check whether all straw bales in the wall are neatly placed in line with each other. And where the straw bales still protrude slightly, you can hammer them into position a little better. And where a bale is a bit too deep in the wall, you can pull it forwards a little with a short digging fork.

Guiding plates:

In places where the straw is placed more tightly, there can be a lot of friction between straw bale and wood and between straw bales themselves. Even when placing the last bale, there can be a lot of friction between the already placed straw and the last bale. Covering the opening with a smooth material makes it easier to place the last bale. And after placing you pull the guide out again.

Filling up:

Remaining gaps between the bales themselves and between the bales and the construction are often additionally filled in order to create a wall of straw that is as homogeneous as possible.

Of course, everyone has their own preference for such a simple tool. For me, a stopper stick should not be too short and not too long and, above all, sturdy. I also use the stop stick to push open a location that needs to be topped.

And if parts of a bale are a bit too deep in the wall, you can pry them forward with the filling stick.

4.2 Mechanical tools

There are many tools you can use to work the straw from a bale or the straw in the wall. The basic principle of many of these tools is "cutting" or "beating at high speed"

Tools that cut are: tandem saw, hedge trimmer, sheep shears. Tools that beat with speed are: Chainsaw, Brushcutter, grinder, cutter,

Bosch GFZ:

A method that gives faster and neater results when shortening a straw bale is to use a tandem saw such as the Bosch GFZ or a Dewalt alligator saw. The advantage of the Bosch is that this saw cuts up to the tip of the saw blade.

Dewalt Alligator

With the Dewalt you cannot saw with the last few cm of the saw blade. But theThe advantage of the Dewalt is that there is also a battery version.

Shorten / split bale with tandem saw:

Lay the bale on its side, with the twines horizontally above each other. Measure the required length and cut the bale past the top twine. Stop sawing before cutting through the second twine and tilt the saw a quarter turn into the cut. This creates space to apply a single new twine to the new bale length. When the new twine is tight you can tilt the saw back and continue sawing until the bale is in two parts. It works well if you do this in pairs.

But if you build with large bales, it can be more convenient to work with a straw needle because the blade of the tandem saw can be too short.

Furthermore, the tandem saw can also be used to cut a bale more squarely or to saw it narrower, etc. A tandem saw can also be practical for sawing slots in the surface of the straw bale wall.

Hedge trimmer:

Met opmaak: Uitvullen

Hedge trimmers are often used to flatten a straw wall.

If the straw bales are used “flat / lying”, ie with the widest measurement (48cm) in the depth of the wall, the straw surface can contain so much straw that protrudes that leveling is too difficult for a hedge trimmer. Then it is better to use a chainsaw.

When purchasing a hedge trimmer, you can choose a long or a short blade. A long blade seems very useful, but experience shows that the power per cm of blade length is the best indicator.

Sheep clippers:

It is not often used in straw construction, but it can be a useful tool for making slots in the surface of the straw wall to, for example, install electricity or backing wood constructions

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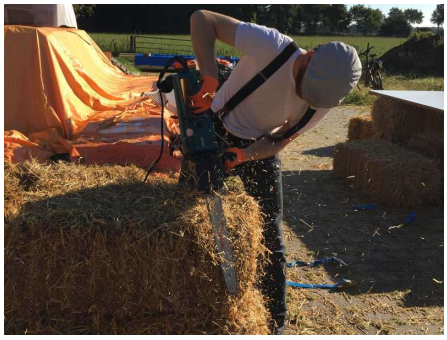
Chainsaw:



A straw bale can also be processed with a chainsaw. This works especially well when the chain is sharp, the revs are high and the straw is tightly compressed. Cutting through a bale with a chain saw does not work as well as sawing with a tandem saw. The chainsaw is especially useful for making slots in the surface and for flattening a straw wall with flat straw bales

Milling:

To make a deeper cavity in the straw for mounting an electrical box, for example, you can use the tip of a chainsaw or you can mill with a fronser drill in a high-speed drill. Do not work continuously here, but repeatedly stamp briefly against the surface at high speed. This prevents the straw from wrapping around the drill and allows the drill to knock the straw away, especially with the high speed.

Trimming:

For flattening larger straw surfaces you can also use a brushcutter / trimmer with a striking blade. To make a wall properly flat with this fairly large tool, this requires the necessary skill.

Grinding:

The surface of the straw bale can also be worked well with a “diamond” disc grinder with a segmented outline or a wood saw blade for an angle grinder.

4.3 Measuring straw properties

Specific weight:

To gain insight into the quality of your own straw construction work, it is wise to measure the specific weight of the straw in the initial phase. You can give a straw bale or part of a straw bale the same density as the compressed wall. By measuring the volume and measuring the weight you can calculate the specific weight.

Moisture:

The straw that is used will generally be sold in a dry state (maximum 25% moisture). Straw that is much wetter also feels wet and this high moisture percentage can soon be recognized by the smell of the straw. And if you have doubts about the moisture percentage of the straw, you can also quickly measure this.

4.3 Additional information

Contact for more information and additions:

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Blusco
BRANDBLUSSER
1. Borgpen wegtrekken
2. Slang richten
3. Knijpkraan indrukken

This study has been done within the Interreg European program UP STRAW.

Interreg is one of the key instruments of the European Union (EU) supporting cooperation across borders through project funding. Its aim is to jointly tackle common challenges and find shared solutions in fields such as health, environment, research, education, transport, sustainable energy and more.

Found more about UP STRAW and Interreg here :

https://www.nweurope.eu/projects/project-search/up-straw-urban-and-public-buildings-in-straw/