Silage and grain bag

Ensiling, conservation and storage

MADE IN GERMANY

BUDISSA BAG®

BAG Budissa Agroservice GmbH

HIGH PERFORMANCE, FLEXIBLE, LOW LOSS, LOW COST, ENVIRONMENTALLY FRIENDLY

Storage of dry market grain in plastic bags

Ensiling, conservation and storage

High performance, flexible, low loss, low cost, environmentally friendly

- Immediate and airtight sealing of delivered materials
- Minimization of undesired reactions during the fermentation or storage process
- Minimization of losses to a biologically inevitable low level
- No contamination due to compacting tractors or other external factors
- Machine technology is a component of silage or storage chains in EVERY performance category (full machine range)
- Flexible choice of the storage area, depending on operational requirements
- low cost system, cost efficient extension of existing storage capacity
- Active environment protection by preventing the sealing of land and wrong investments
- Hermetically sealed and gastight system when used properly

For every purpose the appropriate machine type

According to the different characteristics of harvested crop and the different harvesting and processing technology silo presses of various types are offered.

Rotor Bagger most used machine

A grid at the end of the sealed bag, which is connected with the machine by cable drums, provides a pressure build-up while filling the crop by means of a rotor into the bag continuously (Figure). The continuous filling increases the pressure against the backstop. In turn, the pressure is controlled manually via a continuously adjustable brake system by means of the cable drum. On that fundamental principle the control of the compaction is carried out. Due to the pressure arising inside the bag the machine and the tractor will be pushed forward meanwhile the filled bag remains lying.

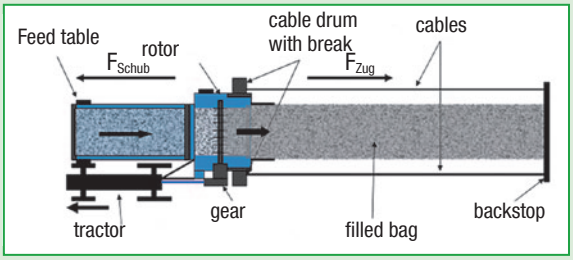


Figure: Functional scheme of a silo press with rotor (Maack, 2009)

The machine's operator controls the film stretching (max. 10%) and adjusts the braking pressure manually and accordingly. In order to fill the rotor machine, end-dump trucks as well as self-loading trailers and wheel loaders are used. Besides, bags with a diameter from 1.20m up to 3.60 m and with a length of 150 m can be utilized. New machine generation do not use cables.

Grain Bagger hopper and auger

This machine is filled by means of a grain wagon, auger or wheel loader via using a hopper, an auger or a conveyor. An auger conveys the substrate into the bag. A silage bag with a length of 75 m contains about 250 t of grain.

Push Bagger hopper and pushing shovel

When using this method, the machine is filled by means of a hopper with organic residues (telescopic loader or grain wagon), which are subsequently pushed into silage bags by using a pushing shovel.

Grinder Bagger hopper, roller mill and auger

The conservation of milled wet grain and corn in silage bags is carried out in a single process by means of a silo press, which is additionally equipped with a roller mill. Using this system saves drying (energy), labour and storing costs.

Truck with tunnel (Truck Bagger)

By means of a truck, which is equipped with a special tunnel, wet Brewer's grains, fertilizers, pellets or grain can be tipped directly from the truck into a silage bag. The silage bag is placed at the desired location and immediately sealed hermetically. The Truckbagger's driver can do the entire work on his own. Working with the Truckbagger requires a certain flowability of the material.

Tubular film

Characteristics

Plastic bags are made of exclusively primary raw materials due to the high quality requirements. The film thickness depending on the bag diameter is usually about > 200 µm. However, considering only this quality criterion can lead to false estimations.

Due to the silo press's compaction process high mechanical strains caused by compressive and tractive forces occur. Parameters like ultimate elongation tear strength, shearing and particularly the puncture resistance (dart drop) are highly important in this context. Table is supposed to give an overview of the DLG-standards for awarding the seal of approval for bunker silo film with a thickness of 200 µm. In contrast internal minimum quality standards for a silage bag with a diameter of 2.70 m are presented as well.

The offered bag diameters are between 1.95 m und 3.60 m (Table). The filling quantities depend on the filling length. Regardless of which tonnage will be stored in silage bags, the cut area of the largest available bag diameter is only about 10 m².

Parameter	Unit	DLG Standard film for bunker silos	Minimum standard 2,70 m tubular film
Recycled material		possible	without
Film thickness	µm	200	215
Deviation - nominal thickness	%	± 5	none
Deviation - single values	%	± 15	± 12
Tear strength	N/mm²	≥ 17	> 23
Ultimate elongation	%	≥ 400	> 750
Shearing	g	-	> 1.800
Dart drop	g	-	> 800
Gas-permeability	cm^3O_2/m^2	< 250	< 200
UV resistance	months	Manufacturer-specific	24

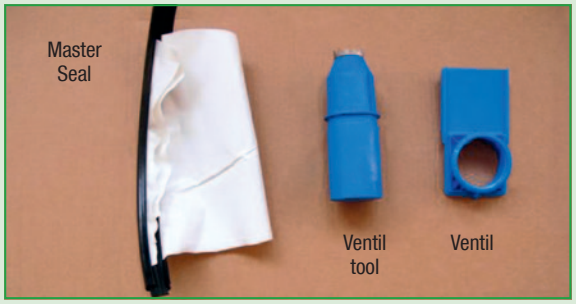
Table: DLG standards for silo films up to 200 µm and internal minimum standards for silage bags with a diameter of 2.70m (Steinhöfel, Weber, Meise, 2006)

Bag Ø in m	Cut area in m²	Filling quantities per running meter t/m	Filling quantities per running meter m³/m	Filling quantities per bag Length (m)	Filling quantities per bag t	Filling quantities per bag m³
1,95	3,0	2,0	3,3	60	100	175
2,4	4,5	3,0	5,0	75	200	340
2,7	5,7	3,8	6,3	75	250	430
3,0	7,1	4,7	7,8	75	320	530
3,3	8,6	5,6	9,4	75	380	640
3,6	10,2	6,7	11,2	75	460	760

Table: Bag diameter and related planning data (standard values)

bag sizes									
length / diameter	1,20 m	1,50 m	1,65 m	1,95 m	2,40 m	2,70 m	3,00 m	3,30 m	3,60 m
45 m				v	v	v	v		
60 m	v	v	v	v	v	v	v		
75 m					v	v	v	v	v
80 m					v				
90 m					v	v	v		
150 m						v	v	v	v

Table: Bag sizes



Sealing the silage bags

After finishing the filling the silage bags will be sealed immediately (Figure). For sealing special closure tapes, which were only manufactured for using this system, are recommended.

Figure:
Closure tapes to ensure an air- and watertight sealing of the bag.

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Proctecting the silage bags – environmental protection

To protect the bags against mechanical damages (wind, birds), they will be covered with protective nets (Figure). In sensitive areas, the access of animals and human beings probably has to be restricted by means of simple or electric fences. Besides, a rodent control has to be carried out if necessary. The bags have to be checked at least twice a week, which needs to be documented as well. Possible damages have to be sealed hermetically with a repair tape.

Reduced CO_2 emissions due to lower silage losses

According to measurements of the Federal Office of Saxony significantly lower DM-losses (CO_2) were observed compared to silages, which have been produced in horizontal silo (Figure).

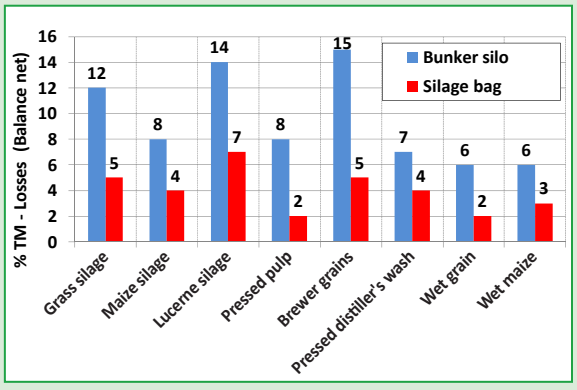

Figure: Losses in bunker silos and in silage bags (mean values of experiments, in part with different universes) (Steinhöfel, 2010)

The plastic film's recycling

The waste film consists of recyclable pure polyethylene and is used by the chemical industry for further processing. Key issues are both the film cleaning and the logistics.

Figure: Removal

Removal

For removal common technologies known from the removal out of bunker silos are suitable. In this connection slicing the bag correctly is very crucial. To have only little scattering losses, the plastic tube should be sliced about 50 cm – 1 m above the ground laterally commencing and semi-circularly over the entire cross section (U-shape). Afterwards, the film is to be folded back. After finishing the removal, the cut area should be covered again with film. In addition, a very crumbly silage requires that the area should be also covered sideways so that residues can fall simply on the film. In any case, the bag must not be sliced lengthwise at the top. Furthermore, the film should lie on the floor lengthwise so that at least one axis of the removal vehicle stands on the film (Figure).

Bagging technology – too expensive?

Table compares procedural costs considering the following alternatives: construction of silo panel or bunker silo and the silage bag technology. All costs (of tillage farming, transport) arising until the crop arrives at the storage area are quite equal. Thus, they can be abandoned in this figure.

Cost parameter	€/t, at least 10.000 t per year bunker silo NEW	Silo panel	Silage bag
Investment (depriciation)	2,00	1,00	0,90
Interest (5%)	1,25	0,60	0,20
Operation (Tractor, wages, etc)	1,75	1,50	0,90
Film	0,35	0,35	1,80
Panel 50%			1,00
Overall cost /t fresh mass	**5,35**	**3,45**	**4,80**
Risk (years)	25	8	8
Market value per t maize silage 30% DM	35	35	35
DM losses ensilage %	8	10	4
Value of silage losses per t solid cubic metre	2,80	3,50	1,40
Costs incl. silage losses per t solid cubic metre	**8,15 100 %**	**6,95 85 %**	**6,20 76 %**

Table: Costs of 3 storage systems using silos (sources: BAG Budissa Agroservice GmbH, Sächsische Landesanstalt für Landwirtschaft)

Investors always have certain expectations concerning their investments and interest charges, their investment risks and operating costs. These have to be considered individually, but the

facts and differences speak for themselves. Considering also the losses in dry matter (quantity losses), which were examined scientifically, it is quite clear that costs arising due to losses are significantly higher than costs for film using the silage bag system. For the latter often there is a need of building a paved area. With smart planning, it is mostly sufficient to calculate a paved area only for half the tonnage. Thus, for example, one can use repeatedly silos for maize silages or other areas, which are vacant in winter, for placing the silage bags (grass silage). Besides, there is the possibility to use also annually changing storage areas for short time storage near the field.

Additional losses associated with quality losses are not evaluated. It is assumed that the feed value decreases either due to a lower digestibility or surface spoilages or rather due to moulds and other germs. This, in turn, leads to higher additional costs. Thus, if it is proper used, the silage bag system is clearly favourable.

„The milk quota will drop soon, the security for farmers is decreasing while there are growing risks and price fluctuations... so, how could I vindicate an investment in fixed installations with more than 25 years of credit period if there is such a great alternative like the silage bag technology? I`m flexible now. I can store all types of fodder in silage bags. Besides, I can increase the animal population at any time without the need of building new storage areas. I just pay for what I have actually ensiled. Additionally, I can help my neighbours and increase the capacity ..."

Farmer and agricultural contractor,
Lower Saxony, Germany

„Biogas plants utilizing by-products can ensure large portions of energy and heat supply. A year-round storage with only little losses is probably just possible by using silage bags. For this purpose, we use large concrete areas, which become vacant at the end of the season ... „

Sugar industry, Germany

„We have large diary farms. All what we want to grow is quite expensive due to the water shortage. By using conventional silos, high temperatures lead to additional high respiration and fermentation losses, which we can not afford in any case. Only the silage bag technology offers the possibility to store silages of the highest quality under these conditions resource-efficiently and cost-effectively. ... Wherever we use this technology people are surprised about the typical and pleasant silage odour. There is no odour nuisance due to acetic and butyric acid ... no more waste is left and our cattle are satisfied ... any doubt about this new system is eliminated ..."

Milk production and forage farming among the desert, Saudi Arabia and Morocco

„Fixed storage places are limited and expensive. At harvest time, when the price is at his lowest level, we are using additional silage bags. The costs are minimal. In silage bags we store about 45.000 t of commercial grain (mostly wheat and barley) directly on the field, what facilitates the logistics enormously. ... Only a few weeks after harvest we sell at a profit, what has cleared away any doubts concerning this system ..."

Grain producers and corn dealers, Oblast Kursk, Russia

„... in the past we were foolish enough to pay 30 EURO and more per tonne for drying our maize, only to wet it later again, while others earned the money...Today we ensile our maize directly after combining for 5 EURO per tonne as whole grain in silage bags, thousands of tonnes per year ... however, we rather do not want to talk about savings ..."

Bioethanol plant, Poland, Czech Republic

„We store both in a centralised and decentralised way. That is why we often use bunker silos, which have to be built first...this, in turn, means high investments whose amortisations do not harmonise with every installation...therefore, using the silage bag system is a good supplement, overall for all types of special substrates as well as for the decentralised storage in order to ease the logistics chain during the harvest ..."

Biogas plants, Europe-wide

BUDISSA BAGGER® RT 7000 FARM

working width with tractor:	5,80 m
weight:	5.500 kg
power requirement tractor:	75–125 hp
performance (depends on feed):	40–70 t/h
useable bag size:	2,40 m (8´)

The machine for small dairy farms and posibility of neighbor support with at least 2.000 tons silage per year.

BUDISSA BAGGER® RT 8000

	RT 8000 Standard	RT 8000 Plus	RT 8000 Profi
working width with tractor:	6,50 m	6,50 m	6,60 m
weight:	7.000 kg	8.000 kg	8.500 kg
power requirement tractor:	160 hp	200 hp	200 hp
performance (depends on feed):	75–100 t/h	to 120 t/h	to 150 t/h
useable bag size:	1,95 m (6,5´)	2,70 m (9´)	2,70 m (9´)
	2,40 m (8´)	3,00 m (10´)	3,00 m (10´)
	2,70 m (9´)		
	3,00 m (10´)		

The machine for larger farms and powerful contractor. RT 8000 with at least 5.000 tons of silage per year and RT 8000 Plus with at least 7.000 tons of silage per year.

BUDISSA BAGGER® RM 8000 / RM 8100

	RM 8000	RM 8100
working width with tractor:	5,30 m	6,10 m
weight:	10.400 kg	11.900 kg
engine:	175 hp	250 hp
performance (depends on feed):	75–120 t/h	90–150 t/h
useable bag size:	2,70 m (9´); 3,00 m (10´)	

The silo press for large dairy farms and powerful contractor with at least 10.000 tons of silage per year.

BUDISSA BAGGER® RT 9000

working width with tractor:	7,90 m
weight:	9.850 kg
power requirement tractor:	to 240 hp
performance (depends on feed):	to 200 t/h
useable bag size:	3,60 m (12´)
feedtable width:	2,80 m

The largest and most effective silo press machines for very large dairy farms, biogas stations and contractor with at least 15.000 tons of silage per year.

BUDISSA BAGGER® PT 600 / PT 800

	PT 600	PT 800
weight:	2.900 kg	4.000 kg
performance (depends on feed):	40–60 t/h	80–140 t/h
useable bag size:	1,95 m (6,5´)	2,40 m (8´); 2,70 m (9´)
option motor:	Honda, 13 hp	Perkins 28 hp

The machine for contractor and big biogas plants for storage of whole sugar beets or other bulk goods and compost in plastic bags. For at least 5.000 tons per year.

BUDISSA GRAIN BAGGER AKRON

	EMD 9400	EX 3600
working width with tractor:	3,20 m	3,20 m
weight:	2.980 kg	2.600 kg
power requirement tractor:	min. 60 hp	min. 90 hp
performance (depends on feed):	to 300 t/h	to 360 t/h
useable bag size:	2,70 (9´)	2,70 (9´)
filing / loading height:	3,20	4,25 m

Storage of cereals, grain maize, fertilizer, among others bulk materials. Removal of cereals without losses - withdrawal capacity to 360 t/h.

ROmiLL M1 und ROmiLL CP1

Romill CP 1

	M1	CP1
max. perfomance rough:	15–20 t	15–20 t
fine:	7–15 t	7–15 t
power requirements (hp):	60–80	120–150
hopper volume:	0,9 m³	3,7 m³
hopper top art:	2,3 m³	
weight:	2.150 kg	2.850 kg

The **ROmiLL M1** is made for the year round use on agricultural farms. The mill can directly come during harvest for use at the field or be used for grinding of dry cereal during the rest of the year.The machine is equipped with one pair of rollers, is be driven by a tractor with at least 60 hp. It is possible to add conservation additives.

The **ROmiLL CP1** is intended for use on the farm, in which the crushed of wet or dry grain -corn to be stored in a bag. The machine with a roller mill is of a tractor with min. 100 hp powered. Add preservative is possible.

ROmiLL M2 / M2 Plus

Romill M2 I Romill M2 Plus

	M2	M2 Plus
max. perfomance rough:	30–40 t	50–60 t
fine:	15–30 t	30–40 t
power requirements (hp):	120–150	160–200
hopper volume:	3,5 m³	3,5 m³
hopper top art:	9,0 m³	9,0 m³
weight:	5.600 kg	6.200 kg

The **ROmiLL M2** is a powerful wet or dry corn mill, which is used in contracting companies. The double roller mill has a power requirement of 120 hp. It is possible to add conservation additives.

The **ROmiLL M2 Plus** is due to longer rolls even more powerful, allowing the powerful use during the grain and corn harvest right on the field.

ROmiLL CP2 / CP2 Plus

Romill CP 2

	CP2	CP2 Plus
max. perfomance rough:	30–40 t	50–60 t
fine:	15–30 t	30–40 t
power requirements (hp):	160–180	min. 180
hopper volume:	3,0 m³	6,0 m³
weight:	4.950 kg	6.900 kg

The **ROmiLL CP2** is intended for use on farms, in which the crushed wet grain is to be stored in a bag. The machine with a double roller mill is of a tractor with min. 160 hp to 180 hp driven.

The **ROmiLL CP2 PLUS** is intended for use by contractors or in large farms. A tug for two operations. Crushing and grinding of wet or dry grain in one operation. The engine is the most powerful Romill with hose system. With a double-roll mill at a roll length of 1200 mm.

BUDISSA BAG®

BAG Budissa Agroservice GmbH

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