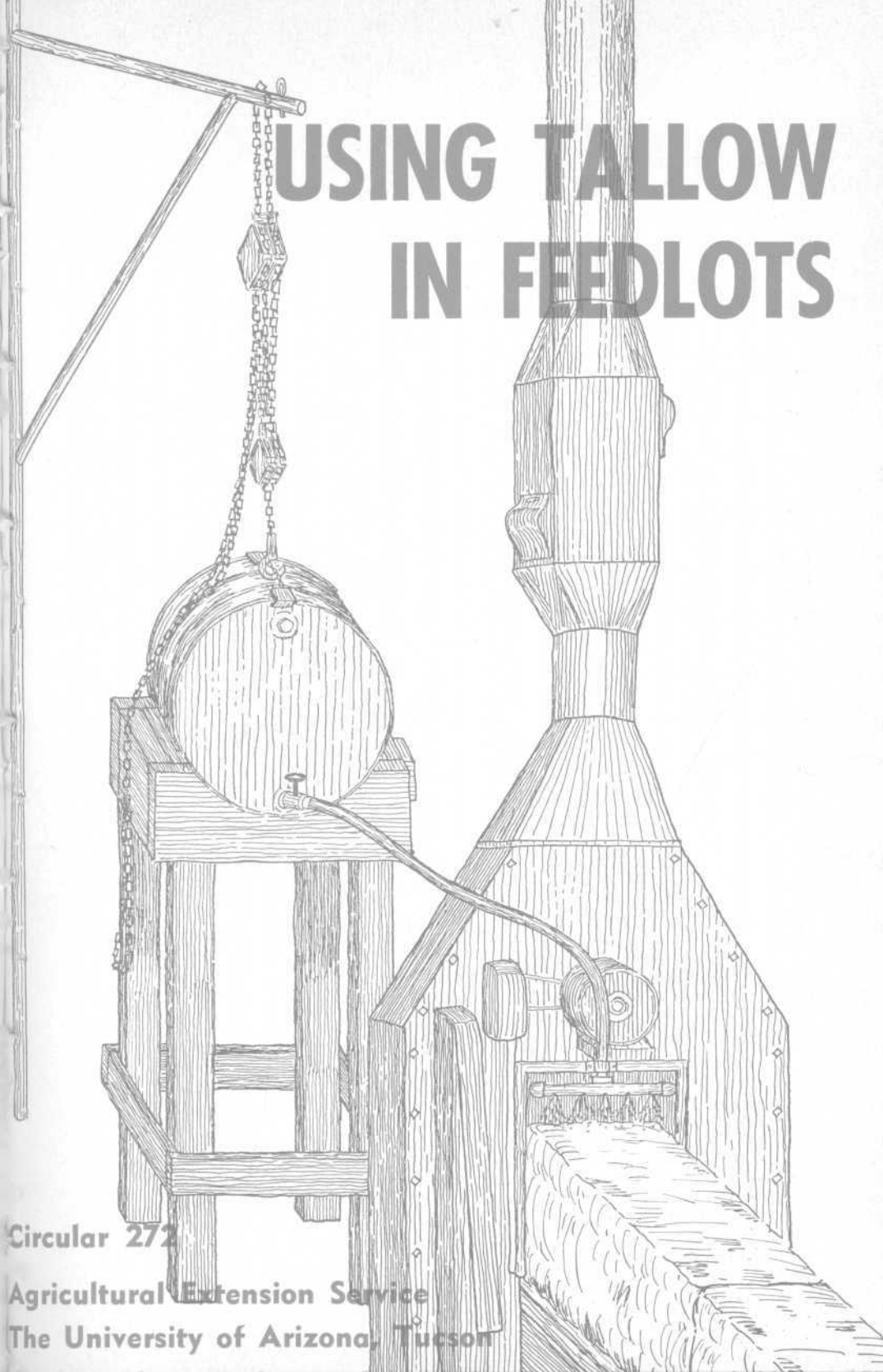
USING TALLOW IN FEEDLOTS



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USING TALLOW IN FEEDLOTS

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Research at the Arizona Agricultural Experiment Station has shown that adding tallow to livestock rations increased gains and feed efficiency.

Feeder experiences with tallow indicate other benefits. Even when the fat costs as much as other feeds (per pound of energy) the additional benefits of feed saved, dust reduction and more pleasant working conditions make it worth feeding.

Feeding Tallow

Recent years have seen a decline in the use of inedible animal fats due to the use of detergents and other soap substitutes. This has created a surplus of fat. Consequently, the cost of inedible fats has dropped to a level where they can be considered for livestock feed. Most of the present tallow used for feeding is in poultry and dog rations. A pound of fat represents approximately two and one-fourth times the amount of energy that is found in a pound of carbohydrate (grain is mostly carbohydrate).

Tallow can be added to the complete ration, to the concentrate, or to the roughage. In most feedlot operations the preferred method is to mix tallow with the roughage

just before it enters the hay mill. (See cover drawing.) At this point a little tallow reduces the hay dust losses at the cyclone and results in cleaner mill operation.

Animal fats are available in several different grades. Thus far, little difference in feeding response has been noted between these grades. The only important specification necessary is that it be stabilized.

Antioxidants are added to prevent rancidity. The trade refers to tallow treated with antioxidants as stabilized tallow.

Handling Tallow

Local tallow plants have large quantities of various animal fats. Standard 55-gallon barrels are commonly used for storage. They hold about 400 pounds of tallow net. Other storage units can be used by special arrangement.

The prime enemies of tallow in storage are air and water—with water being the most objectionable.

If a concrete storage tank is planned, the inside should be painted with a non-toxic, non-fat soluble coating such as silicon hardener, resin or other plastic-based paint. Untreated concrete is porous, and warm fat will eventually penetrate and soften the walls of the tank.

Tallow weighs about nine tenths as much as water or about 7.5 pounds per gallon. It has a melting point varying from 100 to 120 degrees Fahrenheit depending upon its type and composition.

During the cooler months, supplemental heat is necessary to maintain tallow in a liquid form for satisfactory mixing. During the summer in Southern and Central Arizona, black barrels exposed to direct sunlight will result in barrel surface temperature in excess of 150° F. Under these conditions no supplemental heat is necessary to melt tallow.

Tallow Heating Design

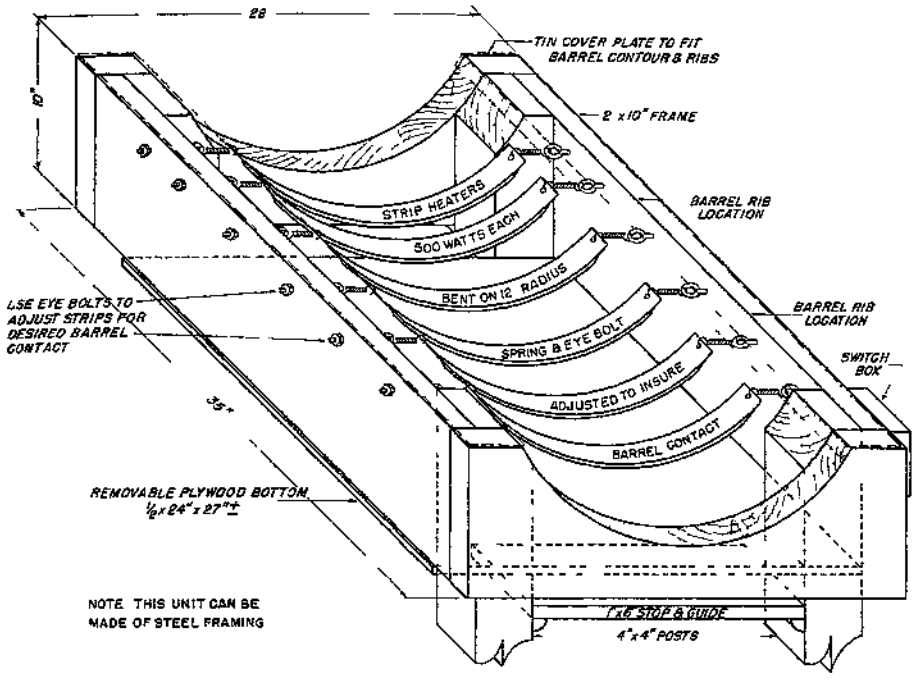
In the design of tallow heating and handling units first consideration must be given to fire safety. **Several makeshift units in the state have started fires which seriously threatened an entire mill.**

Extremely short transfer pipe lines should be used. Eliminate pumps and any other unnecessary transfer equipment where tallow may solidify when idle. Gravity flow from the tallow barrel to mill is the simplest.

Some mills may find it necessary to have long feed and return pipes from storage to the mixing area. In these cases, a gear pump with a relief valve is generally used. All pipe lines and transfer equipment should be steam or electrically traced, and insulated to minimize heat losses.

Beware of brass, bronze and other copper-based metals in fat storage or handling equipment. Copper reacts with fats and hastens the development of rancidity.

Barrel Hot Plate



The safest, simplest and most economical heating device appears to be an electric hot plate specifically designed for barrels. This type of unit uses a series of industrial strip heaters properly designed and shaped to fit standard 55-gallon barrels.

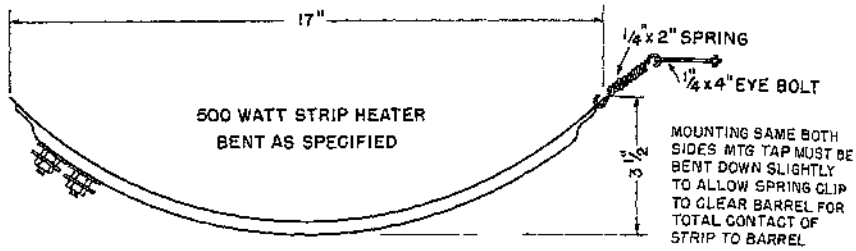
To overcome pipe and pump plugging difficulties it is suggested that the tallow barrel be hoisted onto the hot plate so that tallow can be sprayed by gravity onto the bales as they enter the feed mill as illustrated on the cover page. For complete construction details ask your County Agent for Plan No. A140 "Tallow Heater for Livestock Feeding."

The barrel hot plate should be completely enclosed when the barrel is in place on the strip heaters. A removable bottom is desirable for occasional cleaning.

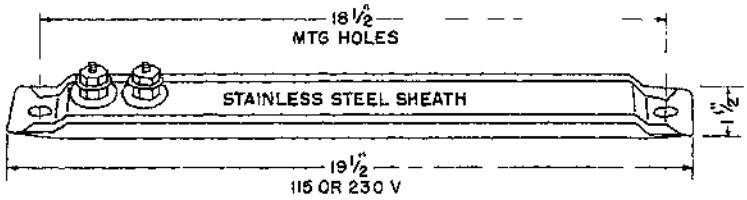
Hoists

Most operators build a conventional pipe hoist frame on which they use a fence stretcher, block and tackle, or chain hoist to set the barrel in its frame for gravity flow. A few have salvaged and adapted electric milk-can lifts that work very well.

Strip Heaters



STRIP HEATER DETAIL



Strip heaters are used for a variety of industrial heating purposes including both air heating and contact applications. For this particular application it is desirable to use stainless steel sheath with a wattage rating that does not exceed 9 watts per square inch of heated area.

This lower wattage rating will give longer life under continuous usage and a lower sheath surface temperature, reducing the flame ignition potential of the strips Standard wattage ratings for stainless steel sheath vary from 11 to 15 w/sq. in.

How To Order

The strip heaters must be bent to fit the curvature of the barrel. Specify bending on a 12-inch radius with terminals on the outside of the curvature. Consult with your electrical supplier or the factory representative to order special lengths, wattage, bending, and voltage.

The following table has been proposed as a guide to assist you in setting up specifications for special order based on the design of Plan No. A140 "Tallow Heater For Livestock Feeding."

Stainless Steel Sheath Strip Heaters

Manufacturer*	Model No.	Overall Length/w Mounting Tabs	Total Wattage	Remarks
Regan Mfg. Co. Phoenix, Ariz.	CRBS1518**	19½"	500 watts	Bent on a 12" radius with terminals on the outside of the curvature. Specify special wattage & 115 volts.
General Electric	2A404**	23½"	500 watts	This element requires a wider and deeper frame design. Specify bending as above and 115 volts.
Westinghouse	1085 756**	23¾"	500 watts	Redesign the barrel frame. Specify special wattage and 115 volts.
Chromalox	SE-1905**	19½"	500 watts	Specify bending and 115 volts.

**Partial list of manufacturers. Check with your local electrical supplier.*
***Catalog number nearest desired size. On order, manufacturers will provide length, wattage and bending to your specifications.*

Note:
Commercial names are used in this circular only for the purpose of identification. This does not constitute an endorsement of any product, nor does it intend to omit other similar products that may be available on the market.

Heater Adjustment

Total surface contact of the strip heaters to the barrel is desirable. Compensation can be made for out-of-round barrels by the use of eye hooks and small springs. Tighten up the eye hook, and the resultant spring tension will raise the strip heaters enough so that the barrel's weight is necessary to depress the strips to the same level as the barrel saddle or frame.

Heater Capacity

Winter temperature in Southern and Central Arizona (100 to 3000 feet elevations) will require six 500-watt elements. For elevations of from 3000 to 5000 feet a total of 4000 watts may be required.

Every other or every third element should be connected to a separate switch so that combinations of 1000, 2000 or 3000 watts can be turned on to match the tempera-

ture variation. The unit illustrated will melt a barrel of tallow for satisfactory flow in about 20 minutes.

Only 1000 watts are needed to maintain liquid tallow in the main feeding areas of the state. If time of melting is not an inconvenience, 2000 watts may be sufficient for melting small quantities of tallow

Wiring

Either 115 or 230 volt circuits can be used. Be sure to consult your electric supplier or contractor for a proper safe wiring installation.

Other Methods of Heating

The first attempts at melting tallow for feedlot purposes was with an immersion type heating element. These were found to be hazardous, unhandy and generally unsatisfactory.

The tallow immediately surrounding the element continued to rise in temperature resulting in poor efficiency, excessive tallow expansion, and possibly some oxidization losses. The heating element just above the tallow surface became red hot, setting up a serious potential fire hazard and the element soon burned out at this point because it was not designed for air exposure.

Steam heating units are used where they are already available in the feed mill installation. Generally this type of installation is complex.

The biggest difficulty has been pipe line and pump plugging when the tallow sets up between operations. This can be overcome with a small steam line wrapped with insulation and running parallel to the transfer lines throughout the system. Such installations are expensive to install, maintain and operate and are entirely uneconomical if a steam unit is not already available and used for other purposes.

At least one manufacturer has made a 2500-watt drum belt heater. While no tallow heating unit of this type has been observed, it appears as though this unit should work successfully with some modification of the barrel frame support illustrated here.

Other heating devices have been observed which are a fire hazard, too complex, or without sufficient capacity to do the job satisfactorily during the cooler months.

Handling Tips

A rough guide for the amount of tallow used per day can be visualized by the following example:

5% tallow-to-hay mix (about 2 to 2½% of total ration)

1000 head of cattle eating 8 lbs. hay/day = 80 bales (100 lbs.)

80 bales @ 5 lbs. tallow/bales= 400 lbs. tallow/day = 1 barrel/day

If you adjust the flow of tallow to just stop the dust losses at the cyclone you will usually be adding 2 to 3% fat to roughage. Then you can keep track of the bales per barrel and adjust for desired percentage.

If tallow sets up in the pipe or valve, just disconnect and place them on the hot plate for several minutes.

Use a gate valve instead of globe valve. It is easier to unplug if tallow does set up.

Tallow Feeding Facts

Although most of the work has been with the inedible animal fats, vegetable fats also may be used and a few feeders are using hydrogenated animal and vegetable fats instead of tallow. Apparently grade of fat has no relation to feed value if it is stabilized and palatable.

Cattle feeders adding fat to dry roughage before grinding estimate that they may be saving as much as two or three percent of the total roughage that normally is lost as dust. By using tallow in this method, there is no clean up of equipment necessary. In fact, it may tend to keep the equipment—mills, drags, and other conveying equipment — in better condition than where fat is not used.

The amount of fat that can be used in a ration is quite variable. At a low level of one percent of the entire ration, it does a good job in controlling dust. However, better responses experimentally have been obtained by going into higher percentages

Excellent results were obtained with approximately four percent of the entire ration being inedible animal fat. Feedlot operators usually add about 1½ to 3 percent fat. Considering all things, five percent probably is the most effective upper limit.

Research Summary

Research at the Arizona Experiment Station has shown that using fat both during the growing period and the finishing period has accomplished the following beneficial results:

1. Daily gains and feed efficiency were increased.
2. Bloat was reduced.
3. Better results with fat were obtained where stilbestrol implants were used.
4. Carcass grade was improved.

The addition of a few percent of fat has not reduced palatability. A feeding trial at the University where approximately .7 pound/day of fat was fed to Hereford steers during the growing phase, and about 1.5 pounds/day added to the ration during the finishing phase showed an excellent increase in gain and feed efficiency. It also reduced the occurrence of bloat when fat was used in the ration.

The following table compares fat supplement to barley and gin trash. This summary includes the additional gain from stilbestrol implants as well as the increase due to fat. The primary roughage was green chopped alfalfa.

Table I. Effect of Fat Added To Growing Ration (89 Days)

% Fat Added to Ration	3.8% Fat	None
Number Steers	22	24
Average Daily Gain		
Stilbestrol	2.84	2.49
No Stilbestrol	2.31	1.93
Lbs. D.M./100# Gain	715	828
Cost/Head/Day (Cents)*	33.2	31.2
Cost/100 lbs. Gain	$12.50	$14.10

*Estimated cost of feed/ton: Green Chopped Alfalfa, $7 00; Barley, $60 00; Fat, $140 00

During the finishing period, the cattle gained more rapidly with the fat although the cost of gain was no longer in favor of fat feeding, computed on fat costing 7 cents a pound. Table II summarized results of the finishing period.

Table II. Effect of Fat Added To Finishing Ration (89 Days)

% Fat Added to Ration	7% Fat	None*
Average Daily Gain		
Stilbestrol	3.60	3.02
No Stilbestrol	2.42	2.27
Lbs. D.M./100# Gain	735	799
Cost/Steer/Day (Cents)	48.9	40.7
Cost/100 lbs. Gain	$16.50	$15.30

*Barley replaced fat in the second lot (both tables)

In this trial, the fat was included in a supplement made up of the following:

Cotton Gin Trash	31.5%
Molasses	3.5%
Barley	51.0%
Tallow	12.0%
Salt	2.0%

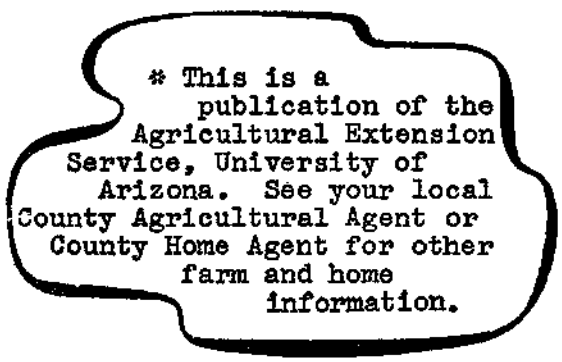
The second lot of cattle that received no fat had an additional 12% barley to replace the fat. Otherwise, the supplements were identical.

The above figure of cost per 100 pounds of gain includes both the stilbestrol and non-stilbestrol treatment. Actually, where stilbestrol was used and the cattle gained 3.6 pounds per day, there was still added return over and above the cost of the fat to the feeder. It might be that the fat influenced this green chopped alfalfa ration more than would have been true in a normal feedlot ration.

Feeder Observations

The general feeling among feeders using fat is that if the fat will break even in cost from the standpoint of nutrition, the additional benefits of feed saving, dust reduction, and more pleasant working conditions make it well worth using. Another apparent advantage is that the fat-fed cattle have tended to grade higher and/or go to market earlier. Fat also reduces the incidence and severity of bloat.

Complete data on the summarized Arizona trial referred to here may be found in Report Number 156. The title of this Arizona Agricultural Experiment Station Report is, "Tallow, Barley, and Stilbestrol for Steers" by E. S. Erwin, et al.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