The addition of 'steamers' and humidifiers' to the F.I.I.F. burley grant program for 2001 has created questions and inquiries about the source and use of such equipment. The FIIF project description states: "... grants will pay 50% of the cost of a new humidifier or steamer for the purpose of casing tobacco, with a maximum grant of $500. The humidifier or steamer must be of industrial capacity and must be purchased in 2001..." For further information on the FIIF grants, contact the FIIF Office at the Ky Farm Bureau Federation, 9201 Bunsen Parkway, Louisville KY 40250-0700, Ph. 502-495-5000, or a County Extension Office.

The following information provides guidance on some available equipment and application methods. Official testing or evaluation of most of this equipment has not been done. The experiences of some users is incorporated into some of the comments. The listing of certain company products is not intended as an endorsement of any one brand nor is the omission of any product intended as discrimination for that product. New sources are welcomed.

**Steamers**

*Note: Cold water humidifiers are discussed below the steamer section*

Some form of steam-producing equipment has been used for cured tobacco conditioning for many years. Various types of salvaged steam engines, boilers and other equipment have been adapted to produce a high temperature, moist vapor that will soften the dry tobacco with adequate quantity of output and time
of exposure.

Important factors in selecting and using such equipment include:

1. quantity of steam output for the tobacco needs,
2. how to apply the steam
3. water and fuel sources,
4. safety features of equipment

'Salvaged' equipment is not readily available anymore and is always subject to safety and malfunction problems. Thus, new equipment is the better consideration and is the only equipment approved for the FIIF grants.

**Equipment types and features:**
A search for suitable 'steam producing' equipment now available and having some potential and applicability for tobacco conditioning has resulted in two company sources that displayed at the recent Nat. Farm Machinery Show. These will be listed below after some discussion of general features and considerations for 'steaming' tobacco.

The current 'steam' units are generally special versions of hot water washers with super powered burners to produce steam and have added safety features. Temperatures up to 300 deg. F are provided by the true 'steam' generator units.

The larger units convert four to six gallons of water per minute into steam. The amount of tobacco this will 'case' or 'order' is dependent upon the surrounding air temperature, the humidity, the starting point moisture content of the tobacco and the air movement around the tobacco.

The steam generating units are either propane gas or oil fired. (Oil for better portability) Diesel fuel is the primary fuel for the oil fired. The larger burners generate over 800,000 to 1 million BTUs per hour consuming 4-5 gallons of diesel fuel per hour. A high pressure piston type pump is used to provide 100 to over 1000-2000 psi for the water flow. These pumps are powered by 3-5 hp electric motors or 8-12 hp twin-cylinder gasoline engines. Clean water is needed for long term dependable operation. Controls and safety pressure protection are featured on the equipment and vary by model and manufacturer. Prices vary from around $2800 to $8000.
Using steamers in barns or other locations for tobacco:
The more successful application of this equipment has been in the
dark fired barns of W. KY & TN where the barns are not too large
and are sealed for the 'smoking' process. The tight barn is more
suitable for containing the steam in the barn until the tobacco
gains the desired moisture content.
The steam can be released through the hand wand and hose
attached or through pipes laid out on the barn floor with holes
spaced to release the steam provided through a hose from the
steam generator. The time to case or order tobacco depends on
many variables: how dry the tobacco in initially, how large the
barn space; how productive the steam equipment; how tight the
enclosure to hold the steam; temperature and other variables.
Some units can let enough hot water drip from the pipes or wand
to cause muddy spots on a dirt floor.
One manufacturer representative states that he does not
recommend the equipment for a more open burley or air cured
type barn unless the barn is wrapped with plastic, i.e. sealed well
enough to contain the moisture inside the barn. Obviously, barns
with numerous cracks and other openings will be hard to contain
steam. The most feasible way to use steam units in these barns is
to apply the steam directly to the tobacco with the hand wands.
This takes time and may not do the best job of uniformly
conditioning the tobacco.
Smaller and lower cost steam producing units can be used
underneath plastic covered pipe rail trailers to condition the
tobacco. And conditioning rooms can be built to contain these
trailers and condition the hanging tobacco or tobacco in other
suitable forms. Conditioning rooms need to be as air tight as
possible, and preferably insulated with a plastic vapor barrier on
the side of the insulation toward the humidified (interior) space.
Gas fired steamers should be placed outside the conditioning
rooms for adequate supply of oxygen and, thus, human safety.
No evidence has been given of steaming internal to a large bulk of
rather dry tobacco, but steaming around the edges and then
covering with plastic to hold the moisture is certainly feasible.
Some producers have learned that hand steaming during the
take-down and bulking process can make the tobacco temporarily
feel good but it does not retain the moisture in the bulk. This obviously is due to the fact that the moisture has not had time to adequately adsorb and penetrate into the stem and stalk material. Normal moisture absorption times for dry tobacco can range from two to 10 hours in a humid environment, depending on the air temperature.

**CAUTION:**
Applying excessive steam directly to tobacco can cause condensed moisture on the tobacco and result in water streaks and potential damage to the tobacco in the bulk, hand-tied bundles or bale. Experienced tobacco workers should readily detect these conditions and avoid damaging the quality of good tobacco!

**Some equipment available:** (Note: No endorsement is inferred for the equipment listed nor discrimination of any not listed. Additional sources are welcomed. Please forward any info.)

<table>
<thead>
<tr>
<th>Diamond Products Inc.</th>
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<tbody>
<tr>
<td>(Office &amp; factory)</td>
</tr>
<tr>
<td>284 E. 1st Street</td>
</tr>
<tr>
<td>Benton, KY 42025</td>
</tr>
<tr>
<td>Ph: 800-713-3087</td>
</tr>
<tr>
<td>Ph: 270-527-4506</td>
</tr>
<tr>
<td>Fax: 270-527-5906</td>
</tr>
<tr>
<td>c/o Mr. Scott Palmer</td>
</tr>
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<table>
<thead>
<tr>
<th>Alkota Cleaning Systems, Inc.</th>
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<tbody>
<tr>
<td>110 Iowa St.</td>
</tr>
<tr>
<td>P. O. Box 288</td>
</tr>
<tr>
<td>Alcester, SD 57001</td>
</tr>
<tr>
<td>E-mail: <a href="mailto:alkota@acsnet.com">alkota@acsnet.com</a></td>
</tr>
</tbody>
</table>

| Alkota distributors in KY:    |
| Big Red Supply               |
| 135 St. Charles Street       |
| Bowling Green KY 42101       |
| Ph: 270-842-7809             |
| Fax: 270-842-7936            |
| E-Mail: donovanww@yahoo.com  |
| Website: www.bigredsupply.com|
Humidifiers:
Humidifying equipment uses water to produce a fine mist or vapor through high pressure nozzles, spinning disks or wetted pads. The output varies by the type of equipment and temperature of the environment.

Devices using the high pressure nozzle or spinning disk techniques depend on the thermal energy in the air to evaporate the fine mist or droplets before they contact surfaces in the space. The warmer the air, the faster the droplets will evaporate and become humid vapor. In 70 deg. F or higher conditions, the droplets can evaporate in a distance of 5-10 feet. For cooler conditions, the droplets may float for 10-30 feet before fully evaporating. If the droplets contact any surface (walls, floor, products, etc.), then the water accumulates to produce wet conditions. The operation of these devices is usually controlled by a humidistat that senses the relative humidity of the air and powers the mist-producing devices on and off as required to establish and maintain the desired relative humidity.

Equipment types and features:
Commercial humidifiers using the spinning disk or centrifugal atomizer type of atomization and mist-producing droplets are produced by several companies. Some have fan blade combinations
to provide greater dispersion of the moist air. Following are selections taken from literature and web sites. The Walton brand disk atomizing equipment was used in an Ag. Engr. Dept. lab years ago and has been used quite effectively at the Univ. of TN Research Stations tobacco conditioning room at Greeneville, TN for a number of years. An article by Dr. Darrell Mundy of UT is available at: University of Tennessee Institute of Agriculture

The largest designs can provide up to 24-30 pounds (approx. 3-4 gallons) of water vapor per hour. Prices range from $700-$1500. Humidistats for operating the units automatically range from $55 for house-quality units up to $200 or more for industrial quality units having capabilities to power the larger horsepower motors of the humidifiers.

**Using humidifiers for tobacco:**
The most likely use of these types of humidifiers for tobacco conditioning will be in a conditioning room. Portable frames or rail trailers/wagons of hanging tobacco would be placed in the space and the humidifiers operated for a few hours to condition the tobacco for handling. Supplemental heat should be a part of the system as the evaporating water will need thermal energy to sustain the evaporation. The warmer the environment, the faster the tobacco will absorb moisture. Data from previous studies have shown the following typical times to condition tobacco starting with very dry tobacco (12% moisture content, wet basis) and moisturizing it to a good handling condition (20% m.c., d.b.). Multiple units may be needed in large spaces.

<table>
<thead>
<tr>
<th>Temp. F</th>
<th>Relative Humidity=85%</th>
<th>Time to case or order burley tobacco from 12% mc.wb to 20% mc, wb at different temperatures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>9.6 hrs.</td>
<td></td>
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<tr>
<td>60</td>
<td>13.9 hrs.</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>24.7 hrs.</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>28.1 hrs.</td>
<td></td>
</tr>
</tbody>
</table>
Some equipment available: (Note: No endorsement is inferred for the equipment listed nor discrimination of any not listed. Additional sources are welcomed. Please forward any info.)

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