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# Quiet Your Noisy Tractor

P. K. Turnquist

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# QUIET Your Noisy Tractor

Agricultural  
Experiment  
Station,  
South Dakota  
State  
University,  
Brookings.



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# QUIET Your Noisy Tractor

by  
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Agricultural machinery noise is not only bothersome, it can be downright unhealthy.

But it can be reduced by providing a suitable barrier between the source of "unwanted sound" and the ear. One way is to properly soundproof a tractor cab. Another way is to use acoustical earmuffs. Both methods have advantages and disadvantages; soundproofing a cab costs about \$100, a pair of earmuffs costs around \$7.

Loud noise, such as that from many tractors, has been shown to be injurious to hearing. Prolonged and frequent exposure to such noise may cause permanent hearing loss. Additionally, some investigators report "... noise above 85 decibels at a certain pitch is now considered a medical hazard and can affect the heart, lungs, blood pressure, nervous system, and eventually every body function." Noise is also classed as a pollutant.

How do I know that my tractor is too noisy?

Engineers can measure sound with special equipment. But you'll likely not have such equipment available to test your tractor. One type of sound measurement unit is the decibel. Engineers and others have set 85 decibels as an acceptable level—that is, a level of sound beyond which they consider damage to hearing is likely to occur.

Most South Dakota farm tractors tested make enough noise to be potentially dangerous to hearing; that is, they operate at levels above 85 decibels.

To get an idea of how this 85-decibel level compares with other sounds consider: ordinary conversation is rated at 60 decibels; 70 decibels is the level of an average radio; 80 decibels for heavy street traffic or factory noise; 90 decibels for a pneumatic drill, some food blenders, loud radio, noisy street; and 95 decibels for an open car window near the ear. Frequent and prolonged exposure to loud noise is to be avoided.

Here are some danger signals: your ears ring or you experience head noises for a few hours after you get off the tractor following a day's work. Another clue is that your speech seems to be muffled when you talk after being around loud noise for an extended period.

The onset of these hearing problems is gradual and insidious. Teenagers and young people on farms and ranches exposed to excessive noise levels may be asking for hearing trouble later in life. Prevention is the best treatment and it must start in the teens. Periodic routine hearing tests of persons in noisy occupations can help prevent many cases of deafness, according to physicians.

## Soundproofing the Tractor Cab

A tractor cab itself doesn't necessarily mean noise will be reduced. In fact, research indicates that the uninsulated tractor cab often tends to amplify the noise and it becomes even louder than without the cab. Addition of acoustical foam to the walls and ceiling and under the floor mat reduced noise levels to safer values in research at the Agricultural Experiment Station at South Dakota State University. This type of soundproofing can be done by the tractor owner. He often can do a better job in sealing openings, especially in the floor, than the manufacturers since it does require some customized fitting.

### MATERIAL NEEDED

Acoustical foam with perforated vinyl facing turned out to be the best sound absorbing material of several tested from the standpoint of effectiveness, being easier to apply, and being more practical after installation because the surface was less likely to be damaged from "scuffing." The vinyl facing also accumulates less dust.

Two thicknesses of acoustical foam (1-inch and 1/2-inch) were used in the experiments and both lowered

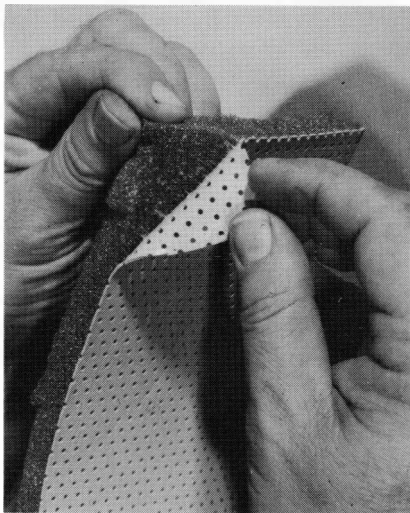
the sound to acceptable levels. The 1-inch thickness was somewhat more effective—and more expensive.

A rubber foam adhesive is best for attaching the acoustical material in the cab. A heavy duty scissors readily cuts the acoustical foam.

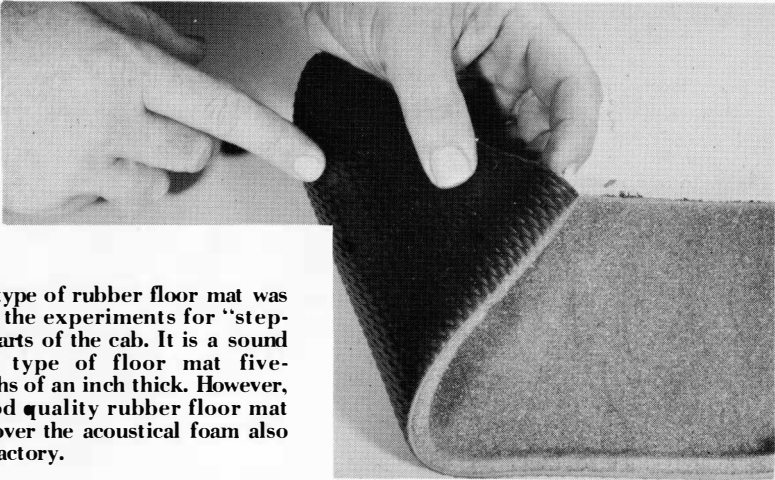
### INSTALLATION

The acoustical foam should be installed on the cab ceiling and on the metal portions of the walls and doors. The console and other exposed parts, including the floor, should also be covered. If possible, place fiberglass insulation (building type) inside the console to act as firewall.

It is important to cover all exposed metal surfaces and to close all holes. Since many irregular shaped pieces of material must be cut to fit inside the cab, templates or a "pattern" of heavy paper will help to eliminate guessing on sizes and shapes of various pieces as well as to reduce need for trimming the acoustical foam. Templates are used to trace size and shape on the acoustical material—a ball point pen does this very well. Follow directions on the label of the adhesive material you use.

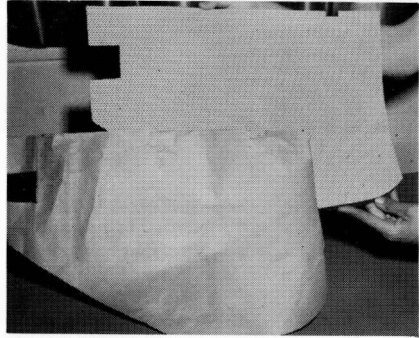


This is the type of perforated vinyl-faced acoustical foam used in the soundproofing study. The vinyl faces out when installed. Although the 1/2-inch thickness gave satisfactory results, the 1-inch thickness was better. Thickness of insulation is a factor in noise reduction.

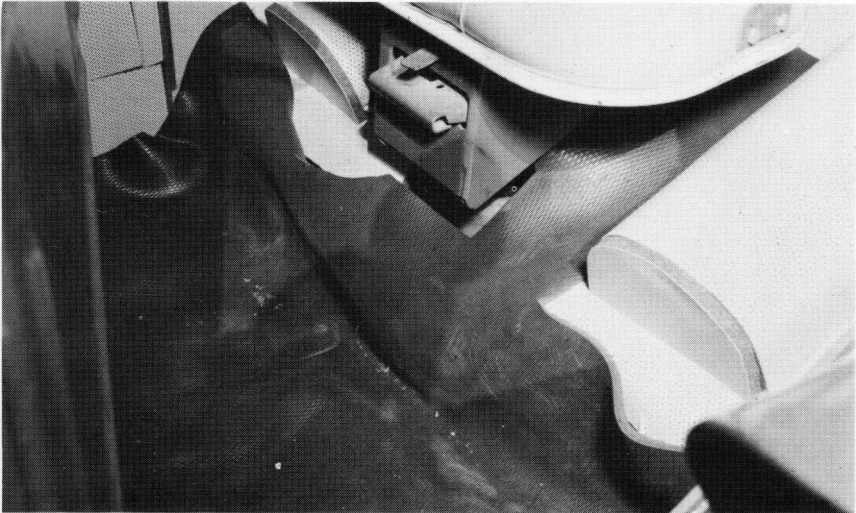


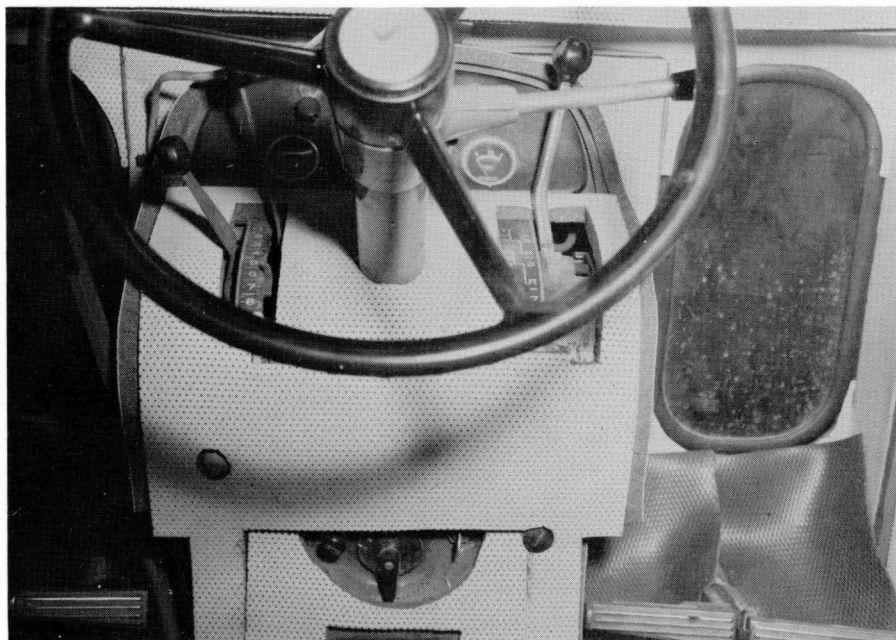
This type of rubber floor mat was used in the experiments for "stepping" parts of the cab. It is a sound barrier type of floor mat five-sixteenths of an inch thick. However, any good quality rubber floor mat placed over the acoustical foam also is satisfactory.

A template or pattern made from heavy paper and the  $\frac{1}{2}$ -inch acoustical foam panel cut from it with a scissors.



The floor mat was placed over the acoustical foam. Other exposed parts, including the seat pedestal as shown here, must also be covered with foam or floor mat for most effective soundproofing. ▼





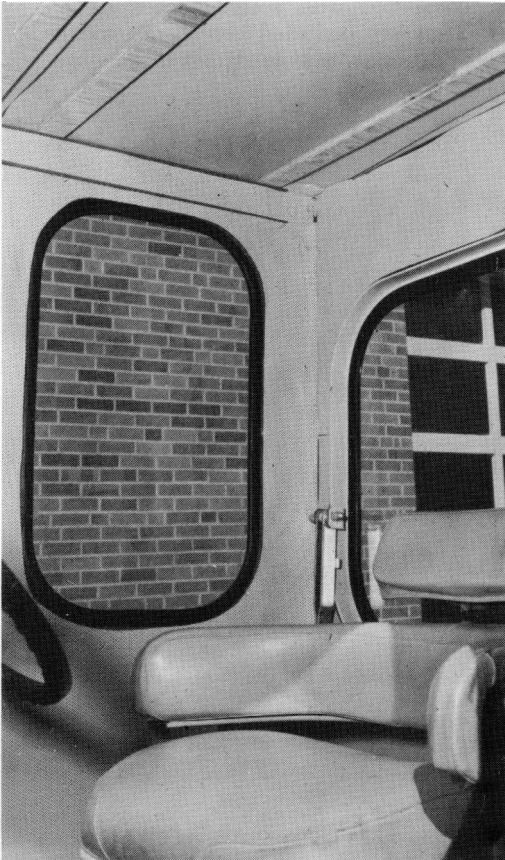
▲  
Tractor console covered with ½-inch acoustical foam. If possible, place building-type fiberglass insulation inside the console.



Boards may be fitted to help support the ceiling installation until the adhesive sets sufficiently.



## Acoustical Ear Muffs



Interior of cab with  $\frac{1}{2}$ -inch foam soundproofing.

This is the type of adjustable lightweight acoustical ear muff used in the agricultural machinery noise research.

Research using lightweight, acoustical ear muffs was in cooperation with a group of farmers. Members of the group tried the ear muffs under various field conditions to establish some of the practical aspects of this method of protection from loud noise. All tractors driven by this group operated at excessive noise levels.

Ear muffs reduced noise to comfortable and acceptable levels in all cases. Some cooperators experienced physical discomfort from wearing the ear muffs but they indicated they would rather wear the ear muffs than be subjected to the excessive noise. Even if not worn 100 percent of the time, ear muffs help reduce the threat of hearing loss due to tractor and agricultural machinery noise because they aid in avoiding prolonged exposure.

Operators claimed that after a short time they became accustomed to the ear muffs and suffered less discomfort. Additional findings indicated these items affect ear muff use: type of field operation, frequency of dismounting the tractor, temperature, and length of time the ear muffs are worn.





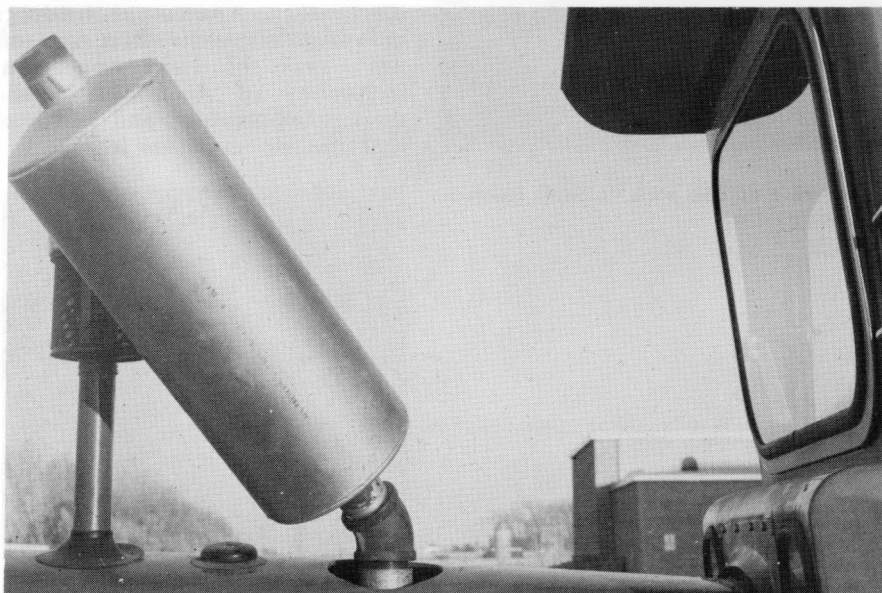
## Other Ways to Help Reduce Tractor Noise

By themselves, the sound suppressing methods pictured below did not reduce noise to acceptable levels although they were helpful when

combined with soundproofed cabs. They are included here to illustrate additional ways in which noise may be reduced.

An extension to a factory replacement muffler directs noise over and above the tractor cab. After you extend the exhaust upward, don't drive out of your shop without first measuring the height of the door.

An exhaust snubber mounted at 45-degree angles toward side and front of tractor tends to reduce and deflect exhaust noise away from the operator. This is a large volume muffler of the type often used on stationary engines and costs about \$50. It must be installed so as to not obstruct the view from the cab.



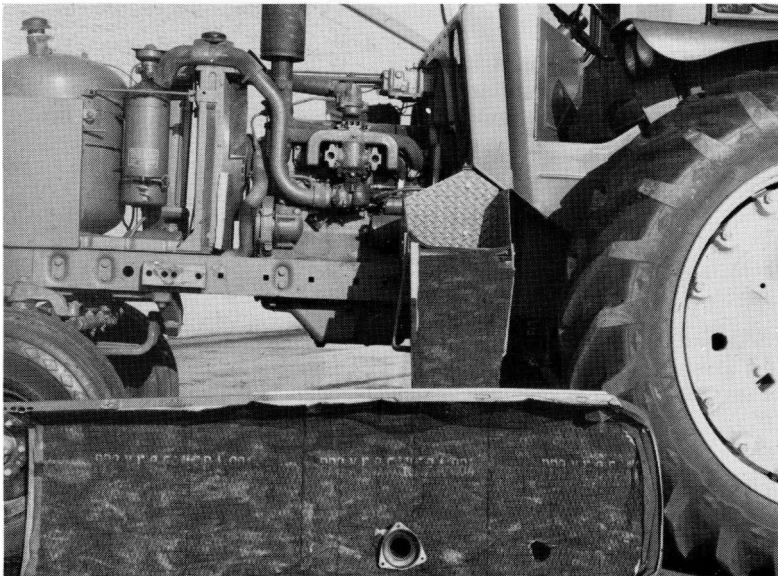
## What to Expect

Let's say you effectively insulate the inside of your tractor cab for noise reduction. That's fine for cool days. But at certain seasons the inside of the cab is so hot you cannot operate the tractor in comfort even with a pressurized cab. If you open a window for ventilation, you undo all or most of your sound conditioning effort. Depending upon how much you value your comfort and your hearing, the next step is air conditioning. Some researchers, in commenting on fixing up your present tractor or in considering purchase of a new one, suggest that you think of a "package" deal: convenience, safety, comfort, less noise, air conditioning.

This tractor used 1-inch fiberglass (in this case) adhered to underside of hood (dismounted, foreground) and to the firewall plus soundproofing the cab.

In the case of using ear muffs, you "learn" to wear them. One cooperating farmer reported that at first the ear muffs gave him a sensation of going around with his head under water. Ear muffs usually can be adjusted to relieve discomfort from side pressure on the head. How about using ear muffs with radios? One operator placed small speakers inside the ear muffs. Others plug in the individual hearing device that comes with many radios and wear the ear muffs over it.

Researchers are serious when they suggest that you think twice before overhauling your tractor after putting on sound deadening devices. The reason: special exhaust mufflers, or insulated cabs, or ear muffs, may tend to mask customary noises so that other "new" sounds become more noticeable. These new or different sounds may mislead you into thinking something is wrong with tractor or attachments.



## Source of Materials

The following sources of materials are not intended to be an all inclusive list—other sources undoubtedly are available. No endorsement of specific products or equipment named is intended, nor is criticism implied of those not mentioned.

### CAB SOUNDPROOFING

Vinyl-backed acoustical foam usually is sold by the foot or square foot from rolls. Rolls 54 inches wide for the acoustical foam are available.

See your implement dealer or contact the Egging Company, Gurley, Nebraska 69141.

Any good quality rubber floor matting material is suitable. A recommended adhesive is 3-M 4500 or equivalent.

Templates may be made from ordinary brown wrapping paper or by splitting the large, heavy sacks from the supermarket.

### ACOUSTICAL EAR MUFFS

The acoustical ear muffs used in these experiments were manufactured by Mine Safety Appliance

Company of Pittsburgh, Pennsylvania. They were obtained through the branch office at 3018 East Lake Street, Minneapolis, Minnesota 55406.

Another source of the ear muffs is the Mechanized Agriculture Club, Agricultural Engineering Building, South Dakota State University, Brookings, South Dakota 57006. The Club established a project to alert farmers to the dangers of excessive machinery noise and also make ear muffs available for those desiring to purchase them. About five months after the campaign opened the Club had received orders for more than 1,800 ear muffs, mainly from a dozen Upper Midwest states.

Other sources for acoustical ear protection are:

American Optical Corporation  
3018 Aurora Avenue  
Des Moines, Iowa 50310

Wilson Products Division  
1985 Janice Avenue  
Melrose Park, Illinois 60160

## Technical References

For technical information on the subject see:

"A Method for Characterizing Agricultural Tractor Noise in Terms of Acoustic Power and Directivity," by T. S. Chisholm and P. K. Turnquist, Transactions of the ASAE, Vol. 12, No. 5, pp. 591-594, 1969.

"Effect of Cab, Soundproofing, and Exhaust-Control Methods on Tractor Noise at Operator's Site," by D. W. Ryland and P. K. Turnquist, Transactions of the ASAE, Vol. 13, No. 1, pp. 148-150, 152, 1970.

"Evaluation of an Acoustical Ear Muff for Agricultural Tractor Operators," by Harlin J. Trefz, M. S. Thesis, South Dakota State University, 1969.

