The audio delay modules don't add any functionality, but they can make the output of the repeater nicer to listen to. The three main benefits are elimination of squelch tails, complete muting of DTMF digits and less of a gap in the audio if the DTMF decoder falses. In some cases they can also help you avoid missing the first word someone says if they talk too soon after keying up. More complete descriptions of the first three benefits follow:

1. When someone that is using the repeater unkeys, the receiver will usually output squelch noise for a few tens of milliseconds before the squelch circuit determines that the signal is gone and deasserts the COR line. If there is no delay in the system, that squelch noise is transmitted before the controller (which is watching the COR line) can mute it. If an audio delay module is used to delay the audio before the muting circuit in the controller, the COR line will be deasserted and the controller can start muting before the squelch tail gets through the audio delay. The result is that you won't hear a squelch tail each time someone that is using the repeater unkeys. You will still hear a squelch tail at the end of a conversation when the repeater hang timer expires and the repeater transmitter drops (an audio delay at the repeater can't do anything about that).

2. Most people turn on the DTMF mute feature of their repeater controllers so that when someone enters DTMF tones to send a command to the repeater controller, the DTMF tones aren't retransmitted on the repeater output. Sometimes they also turn on a "cover tone" so the controller will send some beeps while the DTMF tones are being entered so anyone listening will know that the repeater isn't just keyed up for no reason. If the repeater controller does not have an audio delay, when the first DTMF tone is entered, 40mS or so of it will be retransmitted before the controller detects it and starts the mute and cover tone. If the controller does have an audio delay, it can start the mute and cover tone before the DTMF tone gets through the audio delay, so even the beginning of the first digit is completely muted.

3. When no audio delay is used, the controller is usually programmed to continue muting for a couple of seconds after each DTMF tone is released because it is likely that another tone will be entered soon. That keeps it from allowing the beginning of every DTMF digit to be repeated; once the first digit is detected, all of the digits will be completely muted as long as you don't pause more than a couple of seconds between them. A negative side effect of this several-second long mute is that if someone's voice "falses" the DTMF decoder (if the decoder thinks their voice sounds like a DTMF digit and turns on the mute), the controller will mute their next few words. If an audio delay is used, the controller can be programmed to quit muting as soon as the DTMF digit goes away because the beginning of the next digit (if it ever comes) will be completely muted anyway. With the short mute timer, if someone's voice falses the DTMF decoder, their voice will be muted for only a fraction of a second rather than several seconds. For more information about DTMF (voice) falsing, see

http://www.link-comm.com/faq/dtmf_voice_falsing.txt.

There are cases where using an audio delay module is not desirable. The most notable of these is a link system with many hops. Audio delay modules can be used on the repeater receivers in such a system, but if they are used on all of the link receivers, the cumulative delay as audio passes through the links can cause confusion, similar to international phone calls that have a lot of delay. A better way of reducing the length of squelch tails on such a link system is to use a really fast squelch circuit, such as the one in the Motorola Micor. Such a squelch circuit can be added to other receivers (Link Communications, Inc. sells a small board called the RLC-MOT with the same circuit that is used in the Micor).

This information is obtained from the website of Steve Strobel
Many thanks to Steve for his information