York EMC Services Ltd

Initial Comments on Malfunctioning Tags

37 tags were received (16 January 2011) that had failed to register on the system installed at the abattoir.
Of these: 12 were reported to have no electronics present (either lost or never present); 19 were reported to have been missed by the abattoir reader but could be read with a hand held reader; the remaining 6 were reported to have electronics present but could not be read. (Spreadsheet supplied with tags.)

The following initial tests were undertaken at York:

1) Visual inspection
2) Attempt to read the tag using a panel reader
3) Measurement of the relative signal level produced by each tag
4) Determination of the frequency at which the maximum signal was generated for each tag

1) Visual Inspection

As reported above, 12 tags had no electronics present. The remainder appeared to be intact.

2) Tag reads with panel reader

The intact tags were read using a single panel reader[1]. 18 tags could be read. None of those reported to be unreadable could be read (Numbers 17, 18, 19, 20, 21 and 26). In addition tag number 3 could not be read with the panel reader. (Tag 3 was reported to have been read by the hand held reader.)
Those tags that were read registered at varying distances from the reader. The worst tag read at 35cm from the reader, the best at approximately 70cm from the reader panel. Most tags could be read at 55-60cm from the panel. (All reads with the tag in optimum orientation for maximum read distance.)
This suggests that for at least 18 of the tags that initially failed to register, the effectiveness of the reader set-up at the abattoir could be a factor.

3) Relative signal produced by tags

All of the tags supplied are believed to be of the FDX type. Tags of this type register by switching a load in and out to amplitude modulate the reader magnetic field. A simple system was constructed on the bench (see Annex at end of document for details) to investigate the level of signal generated by the functioning tags. The peak level detected from each tag was recorded and compared to that from a 30mm disc type (Zee) FDX tag that can be read on the panel reader at approximately 75cm.

[1] Edit ID reader HiPR-603A with 60cm x 40cm 0310-1003-00 antenna panel. The frequency of this system was observed to be 132.4kHz.

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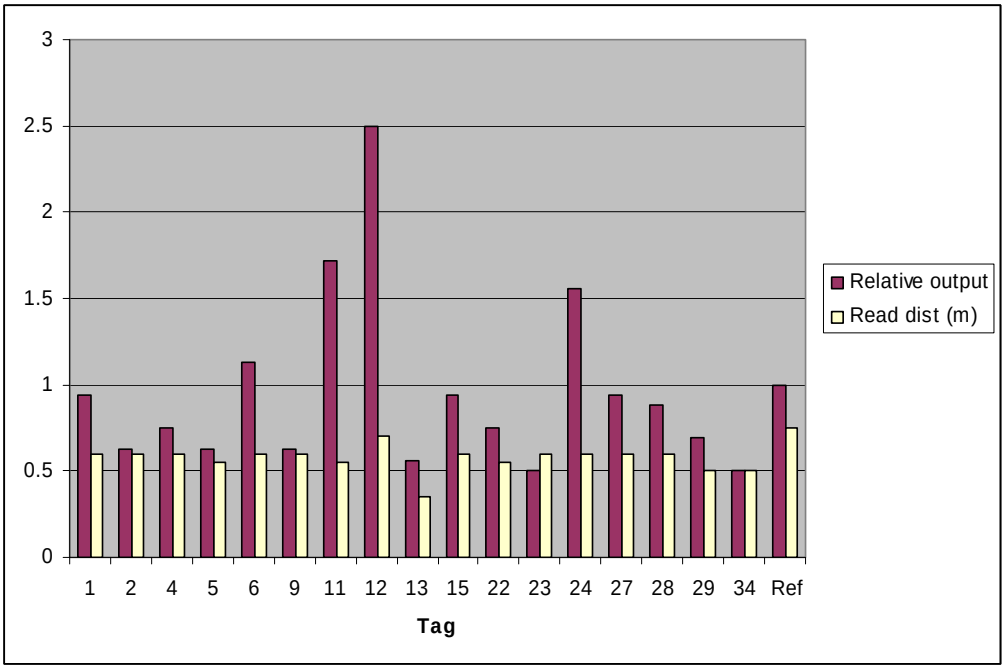
17 tags were examined in this way. 1 tag (tag 30) did not respond to the bench top system. The chart shows the relative output of each measured tag operating at 134.2kHz. There is a wide variation in measured output levels that does not appear to correlate particularly with the read distances observed with the panel reader. This suggests that there is a signal quality as well as magnitude factor that determines read distance. (The output from the demodulator used in this measurement was relatively crude and not suited to better determination of signal quality).



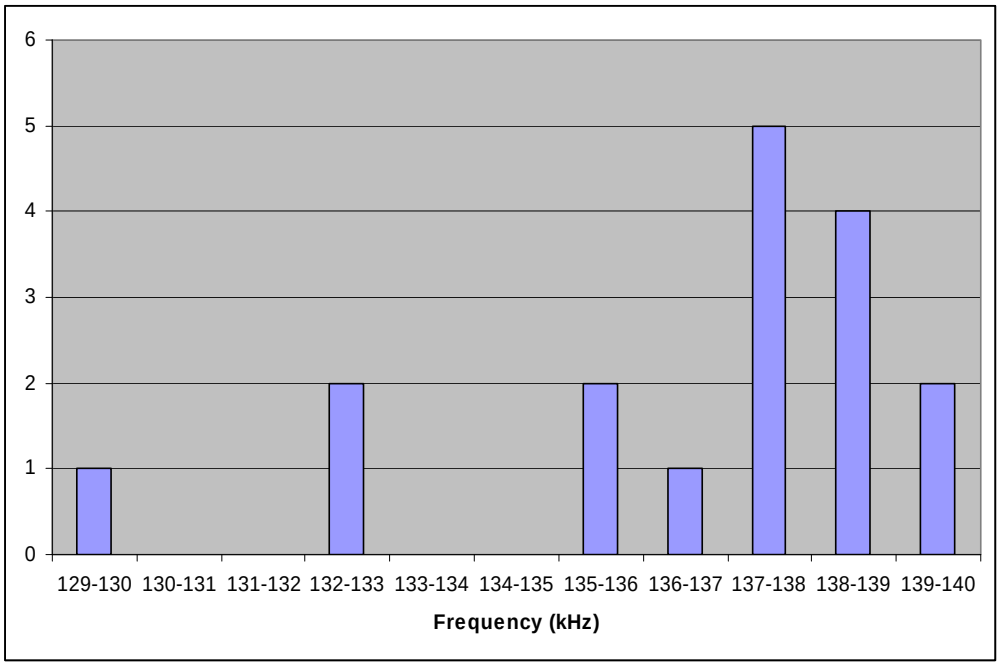
Output signal relative to 30mm disc tag and read distance with panel reader

4) Frequency of maximum signal

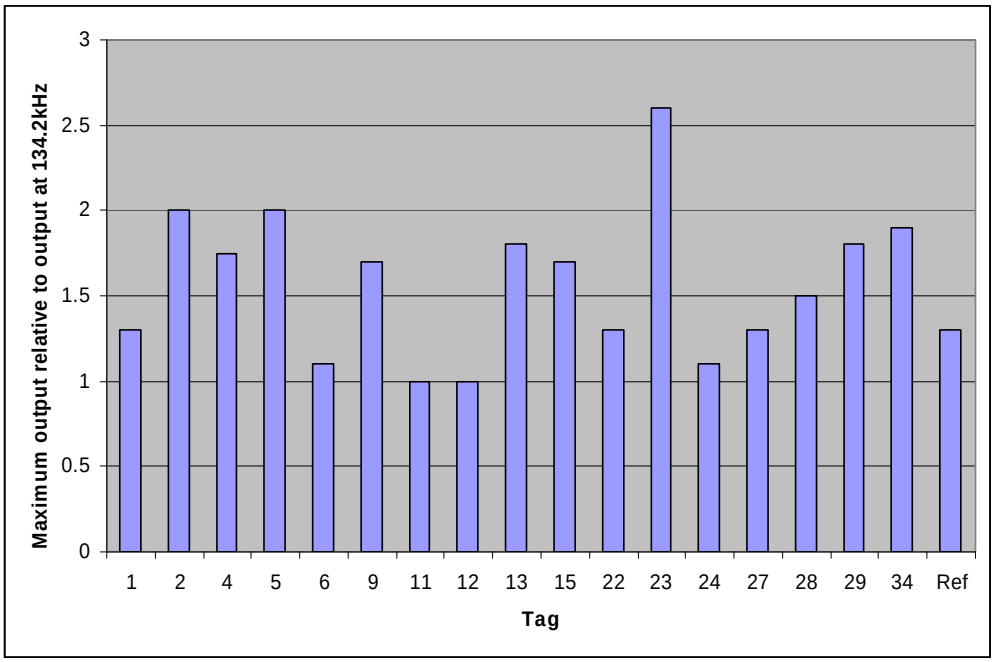
For the tags that responded to the bench top system, the generator frequency was varied to determine the frequency at which maximum signal level was produced.

The results are summarised in the charts. Most tags had their highest outputs at higher frequency than the nominal 134.2kHz.

The highest output of several tags was at least double the output seen at 134.2kHz.



Frequency of maximum signal output for supplied tags



Maximum tag output relative to output at 134.2kHz

5) Conclusions

Approximately half of the supplied tags are functional. It is not known why these were not detected at the abattoir, however if a single panel reader was in use then physical orientation of the tag has a marked effect on read range. Variations in tag orientation could

be associated with either fitting of tags or of the position of the animal's head as it passed the reader.
Approximately one third of the tags contained no active electronics. It is assumed that for most (if not all) tags this is because of loss of the capsule from the tag housing.
The remaining tags appear to have their electronics intact but could not be read.
Of the working tags there is a significant variation in the level of transmitted signal at 132.4kHz although it is not currently clear how this affects read distance.
The frequency at which the working tags produced the highest signal varied. It is not known what (if any) the correlation is between tag read sensitivity and frequency of maximum response; this could be investigated with more sophisticated read equipment.

Annex - FDX demodulator

A simplified system was constructed on the bench to further investigate tag characteristics. This consisted of two loop antennas (one for energising and one for reading tags), a signal generator and a basic AM demodulator.

Tags were energised using a magnetic loop (ETS 7604) fed from a radiofrequency signal generator.

A single turn coaxial loop was placed immediately below the field-generating loop to act as a receiver.

The output from the receive loop was amplified and fed into a simple diode envelope detector; the output of this was amplified and monitored using an oscilloscope.

With no tag present, the output at the oscilloscope showed a small ripple voltage at the generator frequency (134.2kHz). With a functioning tag present, a data signal was seen at approximately 4kHz. (This is consistent with the FDX signal structure defined in ISO 11785.) The peak value of this data signal was used for the various measurements described.