THE NATIONAL SOCIETY OF MASTER THATCHERS

HOW LONG WILL THATCHED ROOFS LAST? - MANAGING EXPECTATIONS

From an historical perspective, dwellings with thatched roofs in Britain were used to house the poorest families; it was the cheapest form of roofing and was often substandard. By comparing early photographs of thatch with those of today, the differences between the condition of the thatch becomes immediately obvious. With social changes during the last 100 year thatch ownership has changed too; with many discerning owners wishing only that their thatch looks as good as the day it was finished, this is an unrealistic and expensive aspiration. Many roofs are re-thatched while they

Traditional annual patch and repair on a National Trust property. Few owners nowadays want their thatch to look like this, although it would have been the norm a couple of generations ago.

still have a useful life remaining; the tendency is to apply a spar coat when the roof starts to look *"untidy"*, the reality is that a scruffy roof that is keeping the property warm and dry is fulfilling its intended function. A thatched roof will wear and lose some of the original *"chocolate box charm"* but for many years after this, it will remain a serviceable roof covering.

Climate

A thatched roof constitutes a very hostile environment for micro-organisms to grow; in the past hot dry summers and frosty snowy winters controlled the speed of decay, by keeping thatch relatively dry and controlling fungal growth. Periods of prolonged heavy rain in the recent past have encouraged the growth of moss and algae, not just on thatch but on tiled roofs, trees and garden furniture, with warmer winters further contributing to expanding colonisation on thatch. The present climatic conditions will shorten the life expectancy of many thatched roofs. Research carried out by Kirby and Rayner (1989) suggested that under normal conditions 2cm of a thatch

Physical wear on a straw thatch. Algae formed a biofilm on the thatch in the winter and a dry summer has caused the film to contract. This has caused tearing and breakage of the butt ends of the straw

surface is worn away annual by weathering It can be expected that a thatch wearing normally will be wet after rain at the surface to a depth of 2cm, but even after continuous heavy rain the moisture content below the surface will be less than17% deeper inside the thatch.

It is believed that many of the current problems associated with early degradation are either inherent in the raw material or are associated with changing climatic conditions.

Thatching techniques are designed to keep water out

Control of the environment within a thatched roof is the interaction between material qualities and thatching technique, the skill of the thatcher, roof design and material quality combine to keep a thatched roof dry on the inside. Under favourable conditions water can evaporate but air movement, temperature and relative humidity will influence its movement. Air movement is temperature dependent, roofs tend to dry out when the wind is blowing; extreme weather conditions will drive water into thatch, the speed at which thatch absorbs water and then dries out is an important factor in controlling the rate that thatch may decay. The easiest and most important, test is moisture measurements; any reading above 17% moisture taken at more that 100mm depth is an indication that water may be penetrating the thatch, which has the potential to support fungal growth below the surface. Changes in weather patterns in the first decade of the twenty first

Fig. 41. Scanning electron micrograph of the node (joint) of the stem of thatching wheat Maris Widgeon at harvest.

century, to wet summers and warmer wet winters means that thatch is not getting periods of hot sun necessary to dry the thatch and to desiccate and kill micro –organisms.

Scanning electron micrograph of the node (joint) of the stem of thatching wheat Maris Wigeon which has been wetted when the yealm is formed. This had been on the roof for only three years. The joint is failing and the thatch stems will now no longer be secured by spars and sways allowing moisture prenetration into the thatch.

An early indication of the potential for straw thatch degradation is fungal breakdown of the nodes. Nodes are the strengthening points in a growing stem and are the point from which leaf sheaths develop. In thatching straw nodes keep the stem straight and form a restriction point which prevents water from travelling along the inside of the stem and so into the roof. Nodes are higher in sugar content that other portions of a mature stem and for this reason are the first point on a stem to be colonised by micro-organisms and the first point to show signs of degradation making node condition a good indicator of the potential for early degradation in thatch. Fungal attack at the nodes will eventually weaken the joint and cause the stem to fracture; in a roof where many stems are attacked in this way, the fixings will eventually become loose and the roof will fail.

Location, quality of thatching and roof pitch

Geographical location will influence the life of a roof; thatch tends to have a shorter life expectancy in the wetter Southwest of the UK than in East Anglia. Wooded areas, overhanging trees valley bottoms and proximity of a river or ponds will also adversely affect the life of a thatched roof.

Under trees and by the River Test. A harsh environment for thatch.

The minimum pitch for a thatched roof is 45°, old properties with multi layers of thatch can lose pitch with the consequence that water is not easily shed and the roof remains wet and may deteriorate more rapidly. Some new build properties are designed by architects who are not familiar with the special roof construction requirements for thatch; often problems in this type of property are exacerbated by a conventional design of house with thatch on top almost as an afterthought, leading to difficult slack pitched dormers.

Aspect

It is generally observed that the north side of a thatched roof will outlast a south or west facing aspect. It is the effects of the movement of moisture and frost triggered by early sunlight that reduces the life of a south facing roof. In seasons of normal rainfall and prevailing weather patterns

the north side is not subjected to such environmental extremes, but because sunlight is often restricted may support the growth of algae and moss. This may become more of a problem if we experience cooler, moister summers and milder winters.

Surface growth on thatch algae moss and lichen

A thatched roof is made up entirely from biological material; the surface can provide a habitat and a food source to support the growth of algae, moss and lichens. The unusually wet seasonal weather, in the past five years or so, has created conditions favourable for the growth and colonisation of many surfaces, not just thatch, by specialist plants of wet areas.

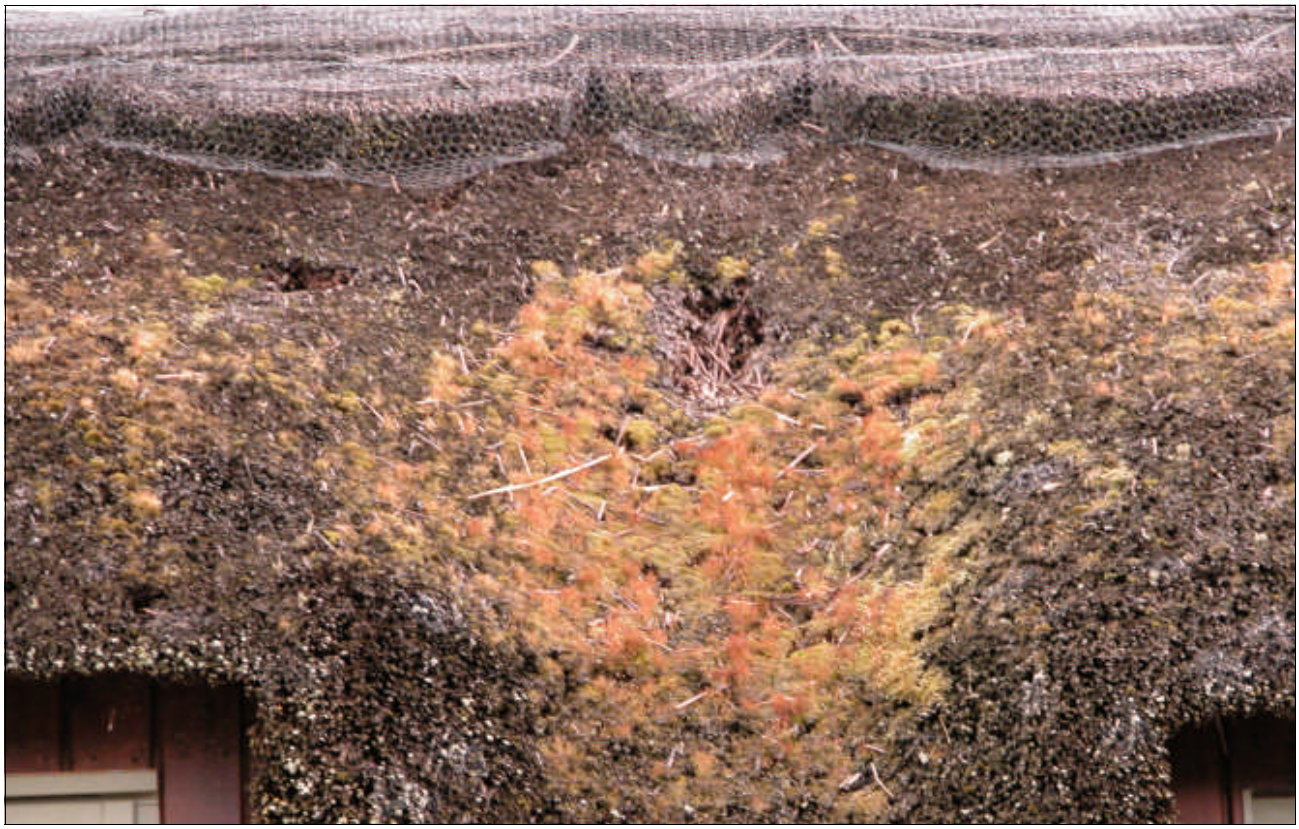
Algae forming a biofilm on the north face of a roof in Devon. The algae form a mass of cells embedded in a mucilaginous gel. This holds moisture and inhibits the drying of the roof and when it does dry out, it forms a crust, which becomes brittle and cracks appear in the thatch.

Algae are a large and diverse group of simple, plants, ranging from single celled to multicellular forms. Algae will colonise thatch in wet conditions, they do no harm but demonstrate

that the area is wet. In windy conditions and spells of hot dry weather will destroy colonies of algae by drying them out, as this dry material cracks it may flake from the surface, sometimes taking with it fragments of thatch to which it has adhered.

Lichens and moss growing on water reed. Lichens are slow growing and indicate that this roof is not wearing quickly at the surface.

Identifying mosses and lichens can often be confusing; in fact, the two organisms are radically different. Lichens are now considered to be fungi especially adapted to obtain food from algae living within their tissues. Lichens form a fascinating example of cooperative relationships in nature, with the fungus relying on the algae for energy, while the algae enjoy the protection the fungus provides. Lichens most likely to be found on thatch are leafy or stringy (foliose) these can also be found growing on the ground or around trees. Lichens can be extremely



Moss on north facing roof surface. There is also bird damage on this roof.

Prolonged periods of rain encourage the colonisation of the straw thatch surface with algae and mosses. These hold moisture and prevent the thatch from drying out.

difficult to properly identify, often requiring the use of magnification and specialized staining techniques to discover the mingled identities coming together to make a lichen colony.

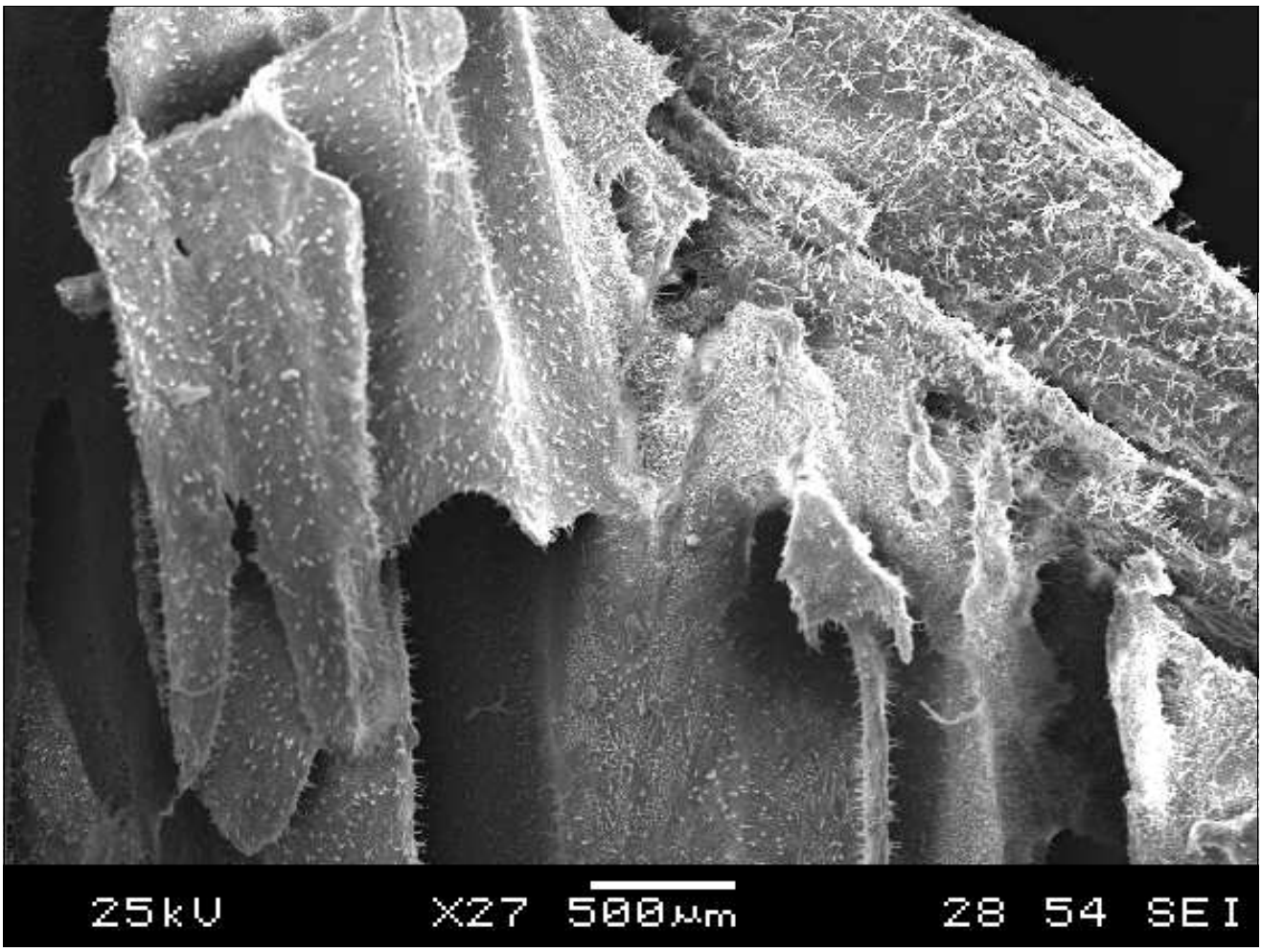
Moss, on the other hand, is a plant; which reproduces by sending out spores, like lichen, moss can reproduce from broken off parts of the parent plant. In general, mosses grow in moist dark areas and have small leaf-like structures, in addition to stems. Lichens often appear grey or pale white in appearance, while moss is usually green.

At present there are no tried and tested chemical treatments for the safe removal of algae or moss from thatch; although there are manufactures with a growing interest in a thatching application for their products. It is illegal to use any commercial chemicals for applications not specified in their license.

Premature decay by white rot organisms

Reports of early failure in water reed thatch, within 4-10 years, were first recorded in 1970, and by 1983 had given rise to considerable cause for concern. At that time the majority of affected reed was home produced; researchers from the Universities of Bath and East Anglia investigated both the potential for infection of freshly harvested reed during storage and also studied the degradation process within thatch. Then as now complaints are associated with soft, weak reed, colonisation of the surface by clumps of organisms that dry out in sunny conditions and cause the surface to physically degrade in windy conditions. This surface colonisation and physical

interaction with the thatch allows the ingress of water into underlying thatch layers providing conditions suitable for further degradation of the reed by fungi and a subsequent reduced life expectancy for the roof. The main body of research on decay of lignin rich materials has been carried out on wood and wood products. However, there are only a limited number of organisms that form symbiotic functions in the decay process many of these organisms appear to naturally colonise both wood and other decaying vegetation such as thatch. In this particular form of attack, decay is not homogenous across the whole surface of the coat work, but can be seen as "*bleached*" areas in either zones or patches; this type of decay is not necessarily associated with high wear areas of a roof such as the junctions of dormers, valleys or gullies. Stems taken from within these patches have often lost both tensile and compression strength causing them to collapse and fragment.



Scanning electron micrograph of basidiomycete "gill structures" hanging from a length of reed in an advanced state of decay. The gills hang vertically from the underside of the straw and produce large numbers of spores. Most have been shed from these gills, leaving "pimples" where they grew.

In nature, old plant material is composed of tough woody tissue, lignin with a small level of carbohydrate present to initiate the process. Many authors on the subject describe a cycle initiated and maintained by groups of organisms each with a specific role at different stages of the decay cycle. In natural reed beds, organisms capable of degrading lignin and cell walls only colonise dead tissue and since the process starts at ground level it is not until the toughest part of the plant (the butt end) has died that breakdown takes place. Under natural conditions the stem then breaks and falls leaving a short stump above the living rhizome, fallen reeds then decompose as part of the natural cycle of the reed bed. The process is complex but the physical manifestation of the decay process on a small number of thatched roofs in different geographical locations all have common features in the manifestation and progression of the break down process.

When early decay in water reed thatch was first identified it was realised that a change in management and clean up of reed beds was essential to ensure the survival of the area, in addition to quality control of water reed as a thatching raw material. The efficient management of the Broads ecosystem probably account for the absent of problems with homegrown water reed at the present time.

What is being done?

In general studies, roof construction including, pitch, thatch thickness and packing density as well as the skill of the thatcher and climatic conditions have all been cited as contributors to the longevity of a thatched roof. However, when assessing the causes for premature degradation it is important to recognise and identify these other conditions and to separate them from any alleged material failure associated with decay associated with contamination at the reed bed.

Premature degradation can be detected at a relatively early phase in the life of a roof, usually within 5 – 10 years after thatching. Decay areas can be random and patchy with not all aspects of the thatch surface being involved. Early signs are light coloured patches and physical cracking on

the surface often associated with surface clumping of the thatch, the problem is exacerbated by physical erosion from wind and weathering and is more obvious after periods of dry weather.

Thatchers across Europe, not just in the UK, have identified this type of decay, specifically in water reed harvested from some European reed beds. Reed from well managed reed beds in the UK is of high quality; harvest timing, cutting, cleaning, dry storage and reed conditioning do contribute to water reed quality for thatching, good reed bed management and post harvest storage conditions do contribute to water reed thatch longevity. Part of the problem is that demand exceeds supply for thatching reed and reed from marginal areas and over harvested sites is being sold to satisfy this demand. In wet reedbeds the butt may turn dark or black, this is a sign of good water management in young reed beds but in old reed it indicates a rapidly decaying biotype with advanced fungal attack. The butt ends of reed will be wetter and more subject to infection than the rest and living reed is more liable to decay. In providing remedial action for a thatch showing signs of this type of decay, the fact that attack takes place at the thatch surface makes recognition of the condition easier and for remedial action to be taken early. Early detection allows a thatcher to clean down the surface and to remove and replace any damaged patches, and to re-dress the thatch. It is seldom necessary for the whole roof to be re-thatched.

The National Society of Master Thatchers is currently engaged in a collaborative research programme to address the issues and is working with thatching organisations in Denmark, Holland and German and the Broads Authority and the British Reed and Sedge Cutters Association to find solutions.

New advances in the technology have led to solvent based borates for timber treatment that may be appropriate for treatment of small patches of decay in thatch. These require further investigation with the manufacturers and in the future may provide a solution to treating decay patches, but chemical treatment is some time away as any new application for new uses of chemicals requires certification before it can be adopted.