

CHURCH ORGANS

their care,
conservation,
repair and
replacement

“Our organ is on its last legs,
... it cramps the style of our worship,
... we can't find anyone to play it,
... repairs? They must think we're made of money!”

An information leaflet from the Organ Advice Committee of the Scottish Federation of Organists and the Committee on Church Art and Architecture of the Church of Scotland.

originally published 1998, revised July 2016.
electronic format by Donald Maclagan July 2016

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Organs on the agenda? This pamphlet looks at the questions and suggests some of the answers. Organ dilemmas are examined from a variety of perspectives: pipe, digital, maintenance, finance, church heating and musical matters. If specific points are repeated under different headings, it only serves to emphasise their importance in each context. We cannot over-emphasise the complexity and uniqueness of each church situation, which is why contact with CARTA is so important.

Originally prepared 1998 by Alan Buchan, Douglas Galbraith and Russell Grant, with additional comment from Organ Advisers and members of the Advisory Committee on Artistic Matters (from May 2005, redesignated the Committee on Church Art and Architecture). Acknowledgement must be made to the late Bob Hooker for his considerable input into the section on electronic organs. The booklet has been revised several times, most recently in 2016 by Alan Buchan and members of the Organ Advice Committee of the Scottish Federation of Organists. Comments and suggestions for inclusion in future revision of this document are welcomed and may be sent by email to: publications@scotsorgan.org

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INTRODUCTION

This booklet aims to provide a general guide to organ care and maintenance, but as every church and organ situation is unique, it is essential that in every case where an organ project is being seriously considered, contact is made with an organ adviser. Browsing the leaflet online and picking and choosing some pieces of advice which sound good, and avoiding others, without direct contact with an adviser, can lead to imperfect results and perhaps to musical loss and financial waste. Each adviser will be happy to guide you through repair or replacement of your musical instrument, taking into account your individual circumstances. There is no charge for an initial visit and report and the adviser's travel expenses are met by CARTA. If detailed supervision of a project is subsequently required the adviser may, however, wish to negotiate a fee, especially if further site visits are required.

In 1986 the General Assembly "urged" Presbyteries to ensure that congregations sought advice from the Committee (now CARTA) in all matters relating to the repair, restoration or replacement of pipe organs, and the provision of new instruments. The Committee noted that many congregations still neglected to consult the Committee. The Committee commended consultation "at a very early stage".

The Organ Advisory Service is provided for CARTA by the Scottish Federation of Organists, whose constituent societies have always been fully ecumenical. The advisers are thus available for all denominations and are also happy to inspect instruments in private ownership.

WHY ORGANS?

There were organs in Scotland before the Reformation, but it was only in 1864 (Church of Scotland), 1872 (United Presbyterian Church) and 1883 (Free Church of Scotland) that the return of organs received the broad consent of Assemblies, subject to Presbytery approval in each case. Between 1865 and 1939, at least 1700 pipe organs were built in Scotland, of which about 1200 survive. Many churches would consider life without an organ colourless and its worship drab.

There are many aspects to an organ. It can have a pleasing aesthetic appearance and contribute to the look of the church; it may be valued for the craftsmanship that has gone into it; its sound may be appealing. Above all, the organ holds its place because of its suitability for leading congregational singing. A pipe organ is generally of a size and tonal design to envelope, surround and support the congregation. The additional lower extension of range that the organ pedals allow, with their deep reverberations, gives almost a physical foundation for the singers, while the high notes lead from the top. The fact that each note, unlike those on a piano, controls several pipes from lower to higher pitches gives the organ a penetrative power which has an enlivening effect on singing. Bellows store the wind so that the pipes sounding at the holding of one chord (as many as 80 or so in a medium sized instrument) are powerful enough to fill the building.

Then there is the matter of variety. An organ may have two manuals (keyboards) and a pedal section, each controlling its own range of pipes. To accompany singing is not just to play the notes but interpret the words and bring out both the sense and the beauty of the hymn. This needless to say is not achieved in situations where organists accompany entire services using the same stops throughout! The two manuals, as well as being capable of variety within themselves, deliver different colours of sound, enhanced by the second manual's pipes being in a box which can be opened and closed (the 'swell'). The pedal department can be used gently or forcefully, or it can be left silent for a verse. This flexibility, in good hands, can mean that people as they sing are constantly being awakened, alerted and assisted in their interpretation of the words they are singing, to the enhancement of the worship.

ORGANS ON THE AGENDA

There are particular times when the organ comes under discussion.

The congregation wishes to make use of more contemporary styles of music and the organ seems unsuitable for accompanying these.

Ask first of all whether the hindrance is not in the instrument but in the organist's unfamiliarity with the idioms in question. Music written for the organ can be rhythmic and fast moving. It may be that the instrument is capable of more flexible use than is usually required of it, but needs to be played in a certain way. Again, the organist may have strong views on modern hymns and be unwilling to play them. Thoughtful and sympathetic dialogue is called for before expensive decisions are taken. The organist may be making an important point from his or her knowledge, experience and commitment to music and its role in worship, and should be listened to. Equally, he or she may need to hear other genuinely held views and may benefit from a widened perspective. The online resource *Different Voices* and other material from the Mission and Discipleship Council may help in such a dialogue.

Nevertheless, the organ is not always the right instrument to accompany some music. There are, however, more ways of achieving variety than of replacing the existing pipe organ entirely. Many have found it helpful:

a.) to acquire a piano or an electronic keyboard, which will widen the scope of the kind of accompaniments that can be provided. This means that songs and hymns in other styles can be sung;

b.) to gather together a small group of instrumentalists who might accompany suitable songs and hymns for which an organ would sound too heavy. This has been a very welcome development in worship in recent years. Preparation for such worship groups can be labour-intensive for a director of music, and personnel will not always be available when required for special services, or weddings or funerals when an organ is often essential, but the practical involvement of members of the congregation and others brings its own benefits;

c.) to recover the old Scottish custom of singing unaccompanied with the help only of a precentor or conductor. Many hymns and songs which come from other countries today require this kind of approach, and indeed are so structured that harmonies are created.

There is a growing feeling that a particular instrument is not equal to what is required of it.

While such a feeling may be quite correct with particular instruments badly built or installed, replacement or drastic rebuilding is not always the answer.

A solution may be to re-site the instrument. The organ might have been built into a cramped space which restricts the sound. Or it may speak in the wrong direction, across the chancel area for example. Some find that turning the organ round is their solution. Another is to place the instrument at the back of the church where it is found to give better support to the congregational singing. Resiting a pipe organ may be difficult and expensive for large instruments, but it is much easier for churches with smaller instruments in free-standing cases. Such work, however, has to be done by a professional organ builder of good reputation and not by DIY enthusiasts!

Adding stops to the existing organ - for example, to give a brighter sound at the top end of the pitch spectrum - has quite often been done, with varying degrees of success. With such proposals care must be taken not to spoil what is at the moment an artistic unity. Many Scottish organs have been spoiled by adding to the existing specification, destroying the tonal design and

detracting from the historic value of the instrument. The organ in question might be a good example of a particular school or builder, a small part, if you like, of our national heritage. The effect can be similar to adding a wing to an historic building without properly designing it to merge with the style of the original. Here expert advice should be sought. The practice of adding stops can also prejudice the award of grants from the Heritage Lottery Fund and other sources and thus make eventual restoration unachievable. Unaltered organs have the best chance of being awarded grants for restoration.

A decision may be required because the organ has been giving trouble and repairs have been found to be costly.

An organ fund

The long life of a good pipe organ depends on occasional refurbishment or renewal of particular parts. Some congregations keep a running organ fund so that when the time comes the appropriate repairs can be made. This precaution means that the unwelcome day when a substantial and costly repair is required is longer in coming round.

Is the repair necessary?

The first question to ask is what the builder is offering to do. This may indeed be desirable but, given the financial climate in a particular church, there may be a less ambitious scheme which could be undertaken - or necessary work might be phased over a few years. Here, a visit from an Adviser will be helpful.

When the organ must be replaced

Where however all agree that substantial work is required which the church cannot afford, what comes quickest to mind is to go for a digital instrument. Indeed, organ advisers have made this recommendation themselves in some cases, particularly when the existing organ is not of great merit. Another solution, however, which is not often entertained but which merits careful consideration is the acquisition of a good redundant instrument from another church. This option has much to commend it, not least in terms of cost. The following considerations may be helpful.

A. Electronic or digital organs

This is not such a straightforward decision as it may seem. In a later section of this pamphlet many of the issues are given more detailed consideration. However, two points may be made at this stage.

Financial considerations

A well made organ will have pipes which will last indefinitely. The action required to activate the pipes, particularly if it is mechanical, will last, when in good repair, for 70 - 150 years. This may be why insurance companies have been known to calculate depreciation on pipe organs at only 1 per cent per annum¹. Electronic organs (analogue or digital) have often had a far shorter life. Twenty years has been common, sometimes less, sometimes longer. This is not surprising in that the technology is similar to that of a personal computer, which both ages and becomes redundant. There is also the danger of companies going out of business and the difficulty of spare parts. While some digital organ companies boast that they keep parts for instruments dating back as far as the 1950s, in practice it has been shown that complete replacement after 30 years often makes better economic sense.

¹ *Repair or Replace?* Council for the Care of Churches, p 7

Musical considerations

Present day digital organs are now able to produce a much truer sound than before, and they can also be much more reliable, especially now that sealed - rather than open - electrical contacts are the norm. But although it is claimed that a particular make of digital organ stores and reproduces the actual sounds of real pipe organs, it is wise to recognise that too many of these instruments can still sound characterless. This is partly due to the fact that the sound is delivered through a speaker or speakers which means that the sound is more confined than the more pervasive sound of a pipe organ with hundreds of individual pipes acting as their own resonators. Partly it is also due to the fact that digital sampling of sounds is not done for every note in the scale; two or three per octave at the most is usually thought to suffice. The pipe organ depends on the voicing of pipes and wind pressure to give enough volume, while the digital organ is measured in watts (see article on "Choosing a Digital" below). Although clever use of speakers can assist, the lower the wattage the more distorted the sound can be through speakers.

This factor also has a financial dimension. Congregations will typically choose an organ with what looks like a large range of stops. Often this is far more than necessary for the building. In a building seating 150, a single manual pipe organ of some five stops is adequate.² To make a marketable package, and ostensibly to provide a wide spectrum of sounds, digital organs are usually supplied with a specification similar to a far larger organ. To do this compromises have often had to be made. The actual delivery of volume and variety does not always match its pipe equivalent. For example a single diapason stop on a digital organ with a large specification will not in any way match the volume of the diapason of a small pipe organ suitable for the same building.

The player of the instrument

It is important that the views of the regular organist of a church are taken into account when decisions on an organ or other instrument are taken. Although an increasing number of organists with enthusiasm for digital instruments is now apparent, many churches have found that the purchase of a mass produced digital instrument deters applications from some musicians when a post falls vacant. A committed organist may seek an instrument with individuality and what he or she may consider a natural sound (in effect one in which every note has its own resonator).

The plus side of digital instruments

Some digital models are fine pieces of engineering and make good instruments. They may not be affected by low humidity levels in a building in the way that pipe organs undoubtedly are. Some firms do not follow the practice of simply marketing a variety of standard models but build the digital organ after study of the building and local requirements. Digital firms refer to this as *customising*. It is quite possible - though it all too rarely happens - for a digital firm to build its consoles from traditional materials, including natural woods and reclaimed ivory, bone or wood (rather than plastic, which is non-porous and slightly uncomfortable to play) for the keys. Good digital organs, *customised* or not, are still quite expensive for what they are, and a congregation may find that what it might pay for such an organ could in fact finance a rebuild or restoration of their existing organ (or a good redundant pipe organ - see below). It should be kept in mind that, the larger the building, a far greater number of digital speakers, especially those which cope with the deeper pedal sounds, is required. To make a digital organ truly effective in a very large space can be extremely difficult, very expensive and can never be entirely successful.

Artistic considerations

Where a digital organ is thought to be the best solution, it must be borne in mind that large speakers will need to be mounted, perhaps at different parts of the building. Approval for the siting of these should be sought from the Committee on Church Art and Architecture. To keep the pipe façade of the former organ and to hide the speakers behind it is less desirable because of the pretence involved, although this is quite common. Such siting of speakers often leads to

² See further, *Church Organs* CIO Publishing, pp 5-6

loss or damage of pipes and other parts of the organ and can prejudice any future restoration of the pipe organ, either in its existing location or elsewhere. It is however quite possible in many churches for digital speakers to be housed carefully in an appropriate location within a pipe organ case without the risk of causing damage. The Committee's approval should be sought for the positioning of the digital console, as well as the speakers.

Disposing of the organ

If it has been decided to purchase a digital instrument, the Committee will advise about the disposal of the old organ. However, one possible solution is to retain it intact, preferably without disconnecting the console, unless space is genuinely required. If it is potentially a good instrument but finance only is the bar, it may be that if the digital organ needs replaced, a future congregation may be able to afford the pipe organ's reinstatement. This has already happened in a few churches, sometimes after a gap of twenty years or more.

B. A second hand pipe organ

Another solution which applies in a number of situations is to explore the possibility of installing a good redundant pipe organ. With church closures, there are now numerous excellent instruments awaiting new homes, some in good condition, sometimes with the only costs being that of rebuilding into the new location. The Institute of British Organ Building maintains the most comprehensive list of redundant organs in the UK - see their website at www.ibo.co.uk

The first step is to arrange for an organ adviser from the Committee to see the building, if he or she has not already been involved in the discussions. The adviser will be able to match one of the existing redundant organs to the building. Such organs are often available free of charge to a good home. An organ builder will then be asked to give an estimate for moving and, if necessary, making any repairs to the instrument as it is installed.

This option is not pursued as often as it perhaps should be. Churches sometimes see the option of acquiring another old organ as undesirable. In fact, organs built in the High Victorian era (c.1870-1900) were often made with extremely durable materials and have an inherent quality likely to outlast organs built in the leaner inter-war or post-war years. An older organ with mechanical action may also be more reliable than a later mid-20th century organ with pneumatic or electro-pneumatic action.

Organ builders are sometimes reluctant to promote this very sensible option, preferring to quote for brand new instruments at huge prices which they must be aware few congregations can nowadays afford. In part this is because they believe that organs should be made to measure for a particular building and its acoustics, and partly because many of them seldom actually have the opportunity to foster the craft of building anew, and feel a strong urge to do so.

C. A new pipe organ

Despite the huge cost of purchasing a brand new pipe organ, a surprising number of churches have pursued this option over the last thirty years or so. No fewer than five central Edinburgh churches have taken this route, all with substantial instruments from a variety of organ builders. Most of these organs are a great asset to the worship and to other church and cultural events. However, it can at the time of construction be a considerable drain on a church's financial resources. It is the kind of project which can be brought to fruition if a specific legacy has been left for the purpose.

THE ORGAN ADVICE SERVICE

The Committee on Church Art and Architecture is able to draw on a team of advisers through the Scottish Federation of Organists. A visit to the church is free of charge. The adviser may spend an hour or two examining the workings of the instrument in close detail. This allows him to give very specific comment on what exactly might need to be done, what is best left alone, and what could be left for a few years until money becomes available. The adviser will then send a detailed report to the Committee which, if it receives agreement, will then be forwarded to the congregation. This will give a technical appraisal of the instrument and offer an opinion on its musical and historical value. The report typically would outline the options and make recommendations for the congregation to consider.

Advisers may suggest that quotations from more than one firm be sought and advise on the specific matters that should be covered by the estimate. If quotations have already been received, advisers can offer comment and interpretation so that the congregation are helped to choose between them, since no two quotations will exactly cover the same ground. Some organ builders' reports are too full of technical jargon; others much too vague; sometimes they can over-specify and at other times underestimate work required. Most pipe organ builders are, however, craftsmen of integrity with a huge range of skills acquired after decades of experience, or passed down the generations of organ builders for hundreds of years. They are seldom "out to make a fast buck" and usually can be relied on to comment fairly.

The advisory service exists both to prevent congregations spending more money than is necessary as well as to ensure that they acquire or renovate an instrument that best suits their needs.

WHEN THERE IS NO ORGANIST

Modern digital organs have one particular advantage in that they may have attached to them a *MIDI* system by which hymns or indeed whole services can be prepared in advance. *MIDI* is mentioned again later. Most new digital instruments have this facility built in. This can be a useful solution where it is difficult to find a regular organist and allows someone to provide accompaniments to cover for absence. Alternatively, another organist can provide this, although it is desirable that he or she knows the congregation. Pipe organs with modern electric actions can also play music without an organist. Examples with this facility can be found at the Church of the Holy Rude, Stirling and St Andrew's Episcopal Cathedral, Aberdeen.

In conjunction with this, commercially produced disks can be bought which store a large selection of hymns.

A related solution is the concept of a digital hymnal which is an instrument in itself which stores a huge variety of hymns. A search on the internet will reveal one or two up to date versions of this. This might seem an ideal solution for country kirks where an organist, say, is only available for special services, and indeed in many circumstances it will be. Two types of comment need to be made, however. The style of playing may not be what a Scottish congregation is familiar with, and the sound produced often represents an instrument which can sound incongruous in a small church. Further, with the necessity for programming the system so that the right tune appears in the right order for the service, with the right number of verses, at the right pitch and at the right speed, some skill is required of the programmer. Some small rural churches may find that, once bought, they cannot make the use of it that they would like. Nevertheless, many have been grateful for it.

The other type of comment relates to the desirability of seeking other solutions involving people before what should really be a last resort. Music in worship is a co-operative effort between people and leader(s); in this partnership there is come and go as each adapts to the other. With a machine this is less easy. It is not essential that an organ sound be found for

worship. For centuries, a precentor led unaccompanied singing. If there is no one among the regular attenders, is there a local singer or instrumentalist (fiddle or flute, say), a regular participant in the local ceilidh perhaps, who might help – and perhaps be glad to have a role in the local church? Also, young people learn instruments at school; is there one who could 'keep the line' and supply the pitch and momentum required? The most common solution is to acquire a piano, since more people are able to play this than can play an organ. This can be much more cost-effective than acquiring a full scale digital organ with expensive hardware like a pedalboard, which relatively few people now have the expertise to play competently.

Sometimes a keyboard or digital piano is proposed. These tend to have a low output and work best in the context of other (usually electrified) instruments. These are more suitable for the performance type of church music and may be welcomed as part of an ensemble but not be expected to sound well when amplified to the level required to support a congregation.

One not so daft idea is to bring back into use the harmonium that had been left in a corner. There are still one or two people in the UK who can restore and repair these but restoration can also provide a fascinating DIY project for local people. When working smoothly they are not so daunting to pedal as an uncared-for instrument. These have a carrying sound and represent a very cheap solution to the problem, useful during the frequent power cuts still experienced on a regular basis in rural Scotland in bad weather. Quite a few pipe organs, some of them quite large instruments, still retain optional working hand blowing levers. Broughton St. Mary's Church in Edinburgh, which has a powerful Lewis organ of 1882, is an example where this has been used on the rare occasions when electrical power has failed.

CONSERVATION

Mention has already been made of certain pitfalls when adapting or adding to an instrument. The original may well have been carefully designed and crafted as a complete entity and this has made it unique. If the builder has over time become celebrated as an unusually fine craftsman, the resulting organ is a work of art and (as we have suggested) part of our musical and religious heritage. This suggests that an element of conservation enters into the picture when changes are being proposed or an instrument is about to be declared redundant. Often when repairs or refurbishment are called for, an opportunity is offered of restoring a fine historic instrument to its original state. In such instances, the congregation finds itself in the role of custodian of a possible national treasure. Advisers however will not shrink from recommending alterations where these are essential. Often alterations prove neither necessary nor desirable, since a restored historic organ can also be an instrument which is thoroughly artistic, musical, adaptable and much easier to maintain than an instrument with more complicated mechanisms.

This goes also for the appearance of the case. For example, many organs have intricately painted pipework, and any redecoration of these should only be undertaken by a firm recommended by your organ builder. The course of action followed recently in a church in Banffshire of spraying decorated Victorian pipes with blue car paint is not one to be encouraged.

When internal repairs are required to the church and, say, scaffolding is to be erected, thought should be given to the protection of the organ from dust and rubble. It is essential when internal building work is to be carried out that the custodian organ builders be asked in good time to cover and protect the organ. When building contractors are allowed to cover the organ themselves damage almost invariably occurs when they clamber through the instrument, or decide that covering only the larger visible pipes is sufficient, thus leaving the internal parts of the organ open to grit and grime.

MAINTENANCE

That pipe organs require tuning and maintenance is well known, but there is often a false assumption that digital organs, once installed, never require adjustment or work carried out to them, and will never have to be replaced. This is not the case, as some churches who are now on their fourth or fifth electronic organ since the 1960s may be able to confirm.

Pipe organs and digital organs have in common a console of similar function and appearance and produce sounds which can be acoustically analysed and shown to be of broadly similar texture. Otherwise, from a technical point of view, the two types are completely different and their maintenance requirements and the associated costs are not directly comparable.

A pipe organ is a wind instrument with hundreds of pipes of different types (diapasons, flutes, "strings", mixtures, mutations and reeds) activated by an *action* which may be mechanical, pneumatic, electro-pneumatic or electro-magnetic. Pipe organs can last for hundreds of years with periodic restoration and indeed one of the oldest working organs in the UK has a Scottish connection, having been made for the Earl of Montrose in 1602.

A digital organ reproduces sound electronically through digital analysis and reproduction. The sound is played through amplifier and speakers in a similar way that records, tapes, cassettes and CDs have done at different times in recent history. The latest models of digital organs show every sign of requiring very little maintenance and no regular tuning, but leading firms have been known to offer an insurance policy in event of anything going wrong. How long these new models will last before repair or complete replacement becomes prudent is not proven as yet. Older models of digital organ with open electrical contacts do need regular cleaning and will almost certainly benefit from being replaced in due course.

Both types of organ have parts which move and parts which do not move, although digital organs have fewer moving parts than pipe organs. All moving parts are prone to some degree of wear and tear and therefore may need restoration or replacement at some point. The moving parts of pipe organs include mechanical actions, keys, stops, reeds of reed pipes, wind reservoirs, pallets in the wind chests, valves and wires. The moving parts of digital organs include the diaphragms of the speakers as well as the manual and pedal keys.

However, in neither types of instrument are faults confined to the moving parts; indeed organs with the greatest number of moving parts (those with all-mechanical action) can be the simplest to maintain. Electronic components can fail, as can electric actions in pipe organs. The non-moving parts of pneumatic actions in pipe organs can become very problematic. Electronic organs do not normally need regular tuning but their sounds can become distorted to a point where their sounds are unpleasant. Occasionally older digital organs have been known to transpose themselves to different keys, quite involuntarily.

One cannot accurately generalise about the annual costs of maintaining a pipe organ. You will find small late Victorian organs in country churches which have scarcely been tuned or maintained for years, yet they still work acceptably well. On the other hand an organ in a large city church, perhaps rebuilt too often for its own good in the past, with a mixture of actions (partly pneumatic, partly ancient electrics), with too much central heating in the building, can easily cost several thousand pounds a year to keep going.

Enthusiastic organists can learn the basics of tuning a pipe organ, especially of the reed pipes which move most easily out of tune, and thus save the expense of an organ builder travelling a distance on a frequent basis. This was quite normal in the 19th and early 20th centuries. However, fewer organists are inclined that way now. In any case an annual or bi-annual visit from a professional organ builder is more than prudent and will cost a few hundred pounds if a thorough job is done.

In both digital and pipe situations, provided basic requirements are heeded, maintenance costs can be surprisingly low. The best form of maintenance of musical instruments is regular use. Even playing through all the keys on a regular basis, with the power switched on, can help to keep things running in situations where there is no regular organist.

As with every aspect of organ maintenance, every church's situation is different, every instrument is unique, and there is always a variety of solutions, of varying costs, from which to choose. Once again your adviser provided by CARTA is there to help.

ORGANS AND CENTRAL HEATING

One significant threat to the future of the pipe organ comes from an unexpected source - the misuse of modern central heating systems. It is not temperature itself which is the problem, but rather the low humidity levels created by excessive use of central heating systems, sometimes aided and abetted by digital time clocks with minds of their own. Organ builders will always discourage unnecessary central heating of buildings, although they will ask for churches to be heated to normal service temperature when they visit, so that they can tune accurately.

Pipe organs function reliably within a relative humidity range of 60% to 75% at normal interior temperatures. If the level falls below 50%, a pipe organ may suffer in all sorts of ways. If the level increases much above 80%, dampness may be a slight problem.

Generally water-pipe heating systems are the least harmful to pipe organs, and forced hot air systems the worst. Overhead radiant systems can also be harmful, if frequently used. Careful monitoring and control of heating and humidity levels are essential.

Organ humidifiers can also help greatly, although they are not a substitute for careful heating control. The most effective type of humidifier feeds damp air internally through the organ's wind system when the organ is not being used. This can prevent the soundboard sliders from warping or sticking and keeps the wind system operating effectively. External humidifiers can also help prevent wooden pipework and other external parts from splitting, but these are often difficult to position in a location where they can be effective, especially in a large space. Both types can be plumbed into the water mains, but such installations have to be inspected regularly to ensure that they are not likely to leak.

Badly controlled - or uncontrolled - central heating systems can severely damage pipe organs quite quickly. Despite publicity, and various empirical disasters to both buildings and organs over the years, at least two churches with pipe organs decided in 2012 to turn their central heating on, twenty four hours a day, seven days a week. In one case this resulted from a belief that money would actually be saved in the long run, in another the aim was to dry out fabric soaked by leaking water pipes. The Victorian pipe organs in both churches quickly became non-operational; one organ has been discarded and the other is unlikely to be restored. Thousands of pounds have been spent on digital organ replacements.

In such unfortunate situations, it has to be emphasized that it is almost never heat itself which is the problem, but the low humidity which results from heating empty - and often unventilated - buildings throughout the week. The natural heat of the summer is seldom a problem, as such heat is often quite humid, but constant central heating during the winter, especially in freezing temperatures can dry the atmosphere to the extent that organ soundboards warp and leatherwork dries out. Heating the church up to two or three times per week to a reasonable level (e.g. 15-20 degrees) is seldom likely to cause a problem. Keeping the central heating switched on throughout the week, even at a low level, may lead to difficulties. Contrary to the view sometimes expressed by some architects and central heating representatives, heating a building constantly may not be good for the fabric. It can lead to dry rot, warping of furniture, and extraction of essential moisture from the stonework, to say nothing of large power bills.

Each church building may be different. Very old buildings, or those surrounded by trees or vegetation, can retain a high level of natural humidity at most times.

Each situation can be different and churches should not hesitate to contact an organ adviser or organ builder directly about this. Small hygrometers can be bought online or cheaply in gardening centres or other outlets; these can help churches monitor the approximate humidity levels in their buildings.

CHOOSING A DIGITAL ORGAN

The choice before us

Any organist who is involved in the buying of a digital organ, whether it be for home practice or installation in the grandest church building, will be faced with a wide choice. The most reputable large firms like Allen, Wyvern, Makin/Copeman Hart and Viscount have all produced instruments which are of broadly acceptable quality, with variations in musical texture which should be clear to any musical listener. Each firm offers a wide range of models. Their prices in recent years appear to have become more competitive, with less variation between different firms. See also Value for Money section towards the end of this document.

The sales representatives from digital organ companies are experts in selling their product, and most of them are genuinely helpful. Their function is however not to advise on existing pipe organs, or to help churches weigh up the evidence of alternative courses of action, though some take the liberty of doing so. In the world of finance, such a broadening of a sales role would be illegal. Unfortunately, in the world of musical instruments, it is not.

The quality of sound

Irrespective of any technical information, three questions should be uppermost in the mind when making any selection:

- How does it sound? Very often different styles of voicing can be found on one instrument. The more you pay, the more choice you may be offered. There is also a stylistic difference between brands, depending ultimately on which pipe organs have been sampled to produce the digital sounds. Do not hesitate to rely on your own ears and judgement, but be sure to have a demonstration on site.
- How does it handle? It is important that the player feels comfortable and there is a wide range of consoles to choose from.
- How durable will the instrument prove to be in the long term? With relatively new technology, the answer to this is inevitably not yet proven. When digital organs first appeared in the 1970s, the sales representatives claimed these instrument would last 50 years without maintenance, a claim which has by no means proved to be correct. With more recent developments, it is possible that such longevity will prove to be more certain.

It might be useful to provide here a brief technical background to the development of electronic organs since their advent in the 1930s.

Technical background

Every pipe in an organ creates an individual and characteristic sound. This sound can be analysed as a wave formation. This contains all the information about the note structure and harmonic content. The shape of the wave is a recipe made up of the following ingredients:

- the proportion and construction of the pipe

- the material from which the pipe is made
- the way in which the air column is set in motion

What all this means to our ears is the difference between a flute, a clarinet or a trumpet, etc. The way for a machine to read and reproduce such sounds is by the analysis of the wave patterns. This has been done in different ways at different times.

The older type of electronic organ is called **analogue**, the newer type universally produced nowadays is called **digital**. The latter has not changed fundamentally, though a slightly different technique known as “Physical Modelling” has surfaced recently (of which we may or may not hear more in due course).

Analogue

This type has its roots in the late 1930s and, while no longer manufactured, can still be found in regular use in Scottish churches. Maintenance or replacement of these instruments has often been required, but at least one instrument from 1937 survives in use. The most common manufacturer of these instruments was Hammond. Analogue instruments have electronic components called oscillators. An oscillator is a generator which produces a desired vibration which, when subjected to various filters, can reproduce specific sound waves such as flute, oboe, trumpet, etc. The more oscillators, the better the quality.

In older, cheaper models only one oscillator was used, often with “full compass voicing” which in fact made good voicing for each range of pitch somewhat difficult to achieve. It proved much better to voice every six notes. Harmonics speaking before the fundamental, chuff, breathiness, windiness, are all effects which were achieved on analogue organs.

Variety of texture is generally obtained on an analogue instrument by pulling out drawbars (rather than stops), each of which activates a different set of harmonics to give each sound its character. This system is often bewildering to a player seated at an analogue console for the first time, but is quite logical.

Digital

Digital recording means the analysis of sound, the conversion of the information into binary codes, and the storing of this data. As with most digital technology, storage space is measured in units of information, bit, byte, megabit, megabyte; be sure not to get them mixed up!

The wave forms are recorded and analysed from real organ pipes in an echoless chamber and are as true as (1) below will permit. With digital sound the wave forms should be an exact reproduction of the original. However, not all digital sounds are the same, and, as with analogue, depend partly on how close the sampling rates are.

There are three stages in digital sound reproduction:

- 1) sampling rate
- 2) bit resolution
- 3) memory capacity

1) Sampling rate

A computer scans the soundwave at various pitches (measured in Hz and KHz), updating the information as it goes; it converts this information into stored binary codes.

This is the first area where digital quality can vary; the closer the scanning points, the better the quality, but also the greater must be the memory to store this data in - thus more expensive.

The minimum standard sampling rate for compact disc and DAT players is about 45 KHz, which means that the sample is analysing the harmonics (which control the tone of the sound) right to the top of human audibility. Our canine friends might well demand a slightly higher level!

2) Bit resolution

Ideally, bit resolution (a purely technical term) and memory capacity should be considered together. Bit resolution can be imagined as a book containing pages of information affecting the sound – tone, pitch, etc. The memory capacity can perhaps be likened to a bookcase. Capacity is measured in “bits” : 8 bits, 16 bits, theoretically up to 256 bits. 16 bits will provide good quality capacity and most models of digital organ will nowadays have plenty of “bit” capacity.

3) Memory capacity

Needless to say, the memory capacity is measured in megabits!

That is the essence of the technology which lies behind digital organ sound creation, and which most digital organ firms use.

MIDI facility

As mentioned previously, Musical Instrument Digital Interface (or MIDI) was developed to allow different pieces of digital music equipment used in composing and recording to be connected to the organ. At one time this was a separate component, but now most new digital organs incorporate a MIDI system with multiple facilities and functions.

Most systems enable full auto-playback, with the operator having complete control over keying, stop selection, expression, and other console functions. Thus it is possible to prepare an entire service in advance which can be easily activated (though less easy to alter in unexpected circumstances). Pipe organs with up to date electric actions can also have such a facility.

Console of digital organ

Basic construction This varies from manufactured synthetic sheeting to solid oak. The more you pay, the better the finish.

Internal switch gear Open switches on older models attract dirt and carbonisation and from time to time have to be cleaned. Hermetically sealed reed switches now eliminate pollution and any other atmospheric interference.

Keyboards These vary in standard from hollow plastic (which can actually break off) to wood covered with ivory.

Stop Action There is a wide variety:

1) The cheapest is a tablet which, instead of rocking, either lights up or lights a tiny bulb (or LED) above the tablet.

2) Next is a proper rocking tablet, which is illuminated when rocked down. (On older models these may not be lit up by the pistons, thus relying on the player's memory.)

3) Finally there is a generation of drawstop consoles, of varying designs, materials, length of draw and materials. These add considerably to the cost of your digital instrument, but on the whole are preferred by organists.

Pistons Pistons, on both digital and pipe organs, are buttons or pedals which provide a quick way of bringing on particular combinations of stops. Older digital models have

followed the continental practice of having a few general pistons located below the lowest manual. This concept tended to pervade the lower end of the electronic market. Better to purchase a model with pistons for each manual.

Pedalboards There has been, perhaps surprisingly, some variety in pedalboard design in digital organs as well as pipe organs. In the UK the most common type of pedalboard is radiating and concave. However, you still find pedalboards on digital (and certainly pipe) organs which are flat and straight, straight and concave, flat and radiating, and even radiating inward, often depending on where the digital organ is designed, and for which European country. The key sticks on existing instruments in churches vary greatly in dimensions - some are very thin, some are short. Most pedalboards have 30 notes, but some have 32, while others only have 12 notes. Make sure your organist is comfortable with what is on offer; most firms know to conform to the norm of the 30 note radiating concave pedalboard in the UK (sometimes known as the "RCO pedalboard"), but keep in mind that this is not the norm in other parts of the world.

Expression An expression or Swell pedal on the consoles of all organs controls the volume of the Swell division of the instrument (operated by the upper manual). On some digital organs, this controls the volume of the whole organ and defeats the object of the device, which helps to achieve a volume balance between the manuals. Swell pedals which control the volume of the whole organ can still be found on some cheaper models by leading manufacturers, so beware!

In an analogue system, the swell pedal operates as a volume control as on a radio or TV set. Due to its location and type, it is often the first control to suffer from 'scratch' distortion. In a digital system, pushing the Swell pedal accesses more information stored on the hard disc. The more information stored, the more subtle box touches are manageable.

On a pipe organ, you physically open the shutters of a small room containing the Swell pipework, when you push the large Swell pedal.

Acoustic enhancement Reverberation is intended to imitate the decay on a pipe organ in a resonant building and has the effect of allowing sounds to linger once the keys are released. Acoustically dry buildings are always a problem, and any improvement is welcome and perhaps a little reverberation will help. However, you can't apply the same artificial reverberation to singers. Organ, choir and congregation need to be reasonably compatible in this respect.

Transposers Very useful for those who can't transpose! Players with "Perfect Pitch" tend to avoid using such automatic transposers.

Auto-Pedal This is a very useful device for the pianist coerced into playing the organ. The lowest note played by the hands is isolated and reproduced on the pedal stops. This must not be confused with sub-octave or 16' couplers which duplicate all the notes an octave lower and just make the texture muddy. For locations which are likely only to have pianists to play services, auto-pedal could be an important aid.

Both transposers and auto-pedals (though not called that) can be found on some 20th century pipe organs, like the Casson Positive model organs from Edwardian times still found in many country churches. These Casson organs also had a system for bringing out the melody of the hymns played at the top end of the register. Unfortunately the idea was not developed much further.

Speaker system

This is the part of the system which has let down many electronic organs in the past. Speakers were slow to develop in comparison with the technology inside the console. It is only in recent times that improvements have been achieved.

You can imagine how difficult it still is, for example, to recreate with loudspeakers an ff chord held on a pipe organ - 200 pipes sounding together, generating power and excitement, air being thrashed around the organ loft.

It is ideal to have as large an output as possible. This will be measured in watts per channel. A large domestic audio system will have two channels producing 100 watts per channel; smaller systems might produce 15 watts per channel, and portable machines even less. Now consider the size of your church compared to your living room.

High wattage allows two things: good quality reproduction at low levels and minimum distortion at high levels.

A small organ would require something in the region of two channels producing 120 watts, using three speaker cabinets, whereas a large organ would require something in the region of ten, perhaps fourteen, channels producing 1400 watts, using thirteen speaker cabinets in various parts of the building concerned.

Unless for domestic use, speakers built into the console are inadequate. Some of the top manufacturers do not include them anyway, but an adequate external speaker system can add approximately a third to the purchase price, and a good or very good system could add half as much again to, or even double, the original cost.

The larger the building, the more speakers you need. In a very large building you will need at least a dozen, with several more to cope with the Pedal stops producing low pitched sounds. At present day (2014) prices, these can be very approximately £500 each, depending on the individual function of each.

Reliability and lifespan

Like most modern electronic appliances in our homes, digital organs, nowadays, are extremely reliable, and can give many years of trouble-free service. Sealed action contacts have helped greatly. See the section on Maintenance earlier in the document.

Time will tell exactly how long these instruments will last. The question "how long could it last?" may have a very different answer to the question "how long will it last before it becomes more economic to replace it with a more advanced model?"

Conclusion

Never rely on the acoustics in a shop or an on-site demonstration without a speaker system. Take time to visit churches where various models have been installed by the manufacturer's representative.

Once you have decided on which builder you prefer, that builder will normally be pleased to come to your church and design a sound system to suit.

- Take plenty of time to familiarise yourself with the vast array of instruments on offer.
- Bear in mind the possible extra costs for external sound systems.
- Seek independent advice from someone not paid to promote a product.
- Do not be frightened to use your own judgement on how the organ sounds, to express an opinion, or to say "no".

VALUE FOR MONEY

It is difficult to make entirely fair comparisons on prices, but the following may give some general guidance. In the earlier years of digital manufacture, prices were high and this allowed the companies concerned to afford a high sales pitch and excellent attention to aftercare. More recently, while pipe organ maintenance and renovation costs have steadily risen with labour costs, prices of digital organs are now much more reasonable. Do not forget to include VAT in your calculations where appropriate.

Every situation is different. The economics of pipe organs and digital organs are totally different and it is too easy to reach glib conclusions based on a few figures quoted. Do not assume that a digital is the best investment, especially in the long term. There are electronic organs which have given up the ghost after a few months, and there are a few which are still working after fifty years. There are pipe organs which are still working after two hundred years and there are those which have had to be scrapped a year or two after costly rebuilds carried out by supposedly reputable firms.

Our advisers are there to help and be consulted on every occasion. The dilemmas are too complex to be resolved by simply delving in this document or by selectively quoting figures. The arguments can be adjusted in favour of more than one option. There may be a case for choosing an option first and then working out if the economics of the situation can conceivably allow it to happen, rather than letting potentially specious economic theory govern the option chosen.

Cost of buying and installing a new pipe organ

Nowadays this will almost certainly be a six-figure sum, even for a medium sized church.

The exact price is determined by the size of the organ ordered, which is in turn determined by the size of the church and congregation. It is arguably the sort of cost which can only be justified if a church is left money for this specific purpose. The subsequent cost of tuning and maintenance, if there is a suitable guarantee from the manufacturer, *ought* to be confined to a few hundred pounds per annum. A good instrument from a reputable builder ought to last, with periodic restoration, hundreds of years. The same applies to the much cheaper option of a second hand pipe organ of good quality.

Cost of buying and installing a new digital organ

Prices for these - formerly quite expensive for what they comprised - have not increased as much as pipe organ builders' prices in recent years. The websites of the principal digital organ companies are a little reticent about their prices, partly because these will be governed by the nature of specific church buildings. The prices start at about £7,000 for a modest two manual organ and increase to as much as £160,000. Maintenance costs are in theory minimal and in many cases are met by a guarantee lasting at least ten years.

Cost of overhauling, restoring or rebuilding a pipe organ

The cost of this is the most variable of all. A durable and thorough overhaul of a medium sized two manual organ can still be achieved for an average five-figure sum, and if the organ is unaltered may be grant aided up to 70% of the total cost, provided church office bearers are willing to complete a considerable quantity of associated paperwork. Guarantees cover new components only or only aspects of the instrument on which work has been carried out. Annual maintenance costs can still often be measured in three figures.

Cost of installing a redundant pipe organ from another location

The cost of this option need not be significantly greater than that of overhaul, immediately above; similar grant aid and other points apply. It is in some ways the most cost-effective option available, if you choose an instrument with care.

FUND RAISING

Since 1995 the Heritage Lottery Fund (HLF) has been awarding major grants to pipe organ restoration projects. These grants can amount to 70% of the total cost, or more under special circumstances. The Scottish office of the HLF is at 28 Thistle Street, Edinburgh, EH2 1EN. Telephone: 0131 225 9450. Organs which are eligible should be largely unaltered examples of a particular builder's work from the past. Organs which have been extensively altered are not eligible for award.

It is important to show that you can develop aspects of public access and particularly the involvement of children in the educational processes of the project, which can encourage future players. Most organ projects will fall under the HLF's "Our Heritage Scheme". Proposals should involve conservative restoration only. Modernisation of actions or specifications should not be included in any proposals.

A number of other bodies such as the Pilgrim Trust, the Carnegie Trust and the ON Organ Fund have been known to give much smaller grants to organ projects. These can be investigated on the internet. The Institute of British Organ Building may be able to help with up to date lists of grant-giving bodies.

ORGAN BUILDERS AND TUNERS IN SCOTLAND

The Committee does not keep a recommended list of builders and repairers as such. The following are all active in Scotland. The list may not be complete and is intended only as a guide.

Forth Pipe Organs Ltd
15 Cromarty Campus, Rosyth, KY11 2YB
01383 410005
enquiries@forthpipeorgans.co.uk
www.forthpipeorgans.co.uk

Michael and Andrew Macdonald
39 Rockall Drive, GLASGOW G44 5ES
0141 637 1014 or 07885 768904
michael.macdonald1@ntlworld.com
www.macdonaldorgans.co.uk

Lammermuir Pipe Organs (Neil Richerby)
St Michael's View, OLDHAMSTOCKS TD13 5XN
01368 830611
info@lammermuirpipeorgans.co.uk

Paul Miller
31 Vale of Bonnyview, BONNYBRIDGE FK4 1BN
01324 810612 or 07808 762527
jane.miller1@sky.com

John Nobes
19 Castle Street, JOHNHAVEN DD10 0ER
01561 362707

David Stark
Old Schoolhouse, Nenthorn, KELSO TD5 7RY
01573 225567
starkorg@btinternet.com

David Loosley
5 Cauldhame Crescent, Cambusbarron, STIRLING FK7 9NH
01786 461899
doppelfloos@hotmail.co.uk

Harrison and Harrison Ltd
St. John's Road, Meadowfield, DURHAM DH7 8YH
0191 384 3115
www.harrison-organs.co.uk
in addition, this firm has a representative based in Bannockburn

Henry Willis & Sons Ltd
72 Anne Street, LIVERPOOL L3 3DY
0151 298 1845
web@willis-organs.com
representative in Scotland:
details awaited

USEFUL ADDRESSES

The British Institute of Organ Studies (BIOS) exists to encourage the study of the organ and works for the preservation and restoration of historic British organs. Publications include 'Grants for funding work on historic pipe organs' and 'Sound advice: the care of your pipe organ' downloadable from the website www.bios.org.uk BIOS also maintains the British Organ Archive and the National Pipe Organ Register which are worthwhile research facilities.

The Church Buildings Council (Church of England), Church House, 27 Great Smith Street, London SW1P 3AZ, tel. 020 7898 1866, email enquiries@ccc.c-of-e.org.uk, website www.churchcare.co.uk, is responsible for, or can provide, the following publications: 'Sounds Good' – a basic introduction to the organ, 'Historic Organ Conservation: towards the conservation and restoration of historic organs' (Dominic Gwynn), and 'Heating your church' (Colin Bemrose).

The Institute of British Organ Building (www.ibo.co.uk)

General correspondance to the Scottish Federation of Organists Organ Advice Committee may be addressed through: Donald Maclagan, 1 Victoria Court, 72 High Street, Kingussie, PH21 1HZ. Telephone: 01540 662431 or email: donaIdmaclagan@scotsorgan.org.uk

The Scottish Historic Organs Trust (SHOT): administrator: Marion Lees McPherson, e-mail: marionlees.mac@gmail.com exists to help the preservation of Scottish organs and to conduct research on the history of organ-building and playing in Scotland.

ORGAN ADVISERS

Approaches to organ advisers can be made through the office of the Committee on Church Art and Architecture which can be reached on Tel. No: 0131 225 5722 extension: 316 or on e-mail address: carta@cofscotland.org.uk

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INVERNESS AND NORTH SCOTLAND

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The Scottish Churches Organist Training Scheme (SCOTS)

SCOTS is an initiative of the Scottish Federation of Organists, the Royal School of Church Music and the Scottish Churches. It has been set up to find and encourage emerging organists as well as to assist those already in posts who wish to develop their skills. The focus is not so much on achieving technical brilliance as on the gifts, skills and understanding which can contribute to a more satisfying experience of worship for the whole congregation.

SCOTS is a flexible scheme in which participants “pace” themselves, with an Adviser who will help them assess what progress is being made and what matters need more concentrated attention. The Adviser also shares his/her experience of the role of church musician. On the technical side, a participant may also have a regular teacher (frequent or intermittent) who is different from the Adviser. There is no fixed time limit in which any one stage should be completed. Training days are planned when participants can meet each other and work together.

Further information is available from www.scotsorgan.org.uk or from the Membership Secretary, Fiona Goodison on e-mail: tusher@btinternet.com

The Church of Scotland Committee on Church Art and Architecture has its office within the Church Offices in Edinburgh. The address and telephone number are: The Church of Scotland, 121 George Street, Edinburgh EH2 4YN, tel 0131 225 5722, fax 0131 220 3113, email wordoc@cofscotland.org.uk Faxes should be marked for the attention of the Committee.

The Scottish Historic Organs Trust (SHOT)

The Scottish Historic Organs Trust is an independent organisation formed in the early 1990s by Hugh Ross of Leithen Lodge in the Borders. SHOT exists to help the preservation of Scottish pipe organs and to improve awareness of our pipe organ heritage. It maintains an archive of information about pipe organs in Scotland and produces an illustrated Bulletin at least once a year. There are normally at least two meetings per year, an outing in the late Spring to historic organs of note and an Autumn visit.

SHOT also owns several instruments, a chamber organ by James Bruce in Kentallen, a barrel organ from the 1810s by Muir Wood currently being restored, parts of a slightly later barrel organ by Wood Small at Duror and a three stop Scudamore organ at present at Heriot. There is also a range of smaller artefacts and the Trust's aim is to establish a small pipe organ museum. Any enquiry may be made to the Administrator Marion Lees McPherson on marionlees.mac@gmail.com