

Superyachts, like the Twizzle (LH and below) launched last year and worked on by van Berge Henegouwen and the Sofia from the Moonen Shipyard (RH) introduce a whole subset of installation issues



# Super marine

With A/V installation budgets of millions of Euros, it is no surprise that **Steve Montgomery** finds there is a core of installers who have turned their focus on this tough but rewarding residential systems niche

Within the residential environment, custom installation of high-end multi-room audio and video systems has developed rapidly, with equipment now available to suit every type of environment and meet every expectation. Fully integrated systems are commonplace, linking sound, vision, lighting, environmental controls and more recently telecoms and data systems. Forward-thinking custom integrators are passing through the 'safe area' of simple provision of tried-and-tested standard equipment and beginning to experiment with cutting-edge technology and new ideas; all to the benefit of the industry and customers as a whole as these ideas are proven and accepted to become next year's standard equipment.

The comparable specification and installation of audiovisual equipment on ocean going superyachts and megayachts presents a quandary. On one hand, the equipment used must be the latest available; to the highest specification and level of performance, which implies the use of new technologies and components. On the other hand it must be able to operate faultlessly for weeks at a time with no possible opportunity for anything other than local attention. These factors are mutually exclusive: new products and untested concepts are more prone to failure than established product and require regular attention. Consequently a very fine balance must be struck in the specification and selection of systems for marine

installation. In addition, a number of unique and dominant characteristics, including the length of time between specification and commissioning, as well as the environmental situation of yachts affect the choice and layout of these AV installations, so that the delivery of a complete solution is a highly complex and involved process. The risks are high, but so too are the rewards says Roger Horner, Managing Director of E3Systems in Spain. "There are many yachts currently being built or refitted where the total bill for the AV systems is 2 to 3 million Euros. Owners want the best that money can buy, either because they appreciate the level of quality or because they want it to be seen on their vessel; their pride and joy."

## A different specification chain

By their very nature, superyachts are the plaything and/or working tool of the very rich and their owners occupy the very top strata of the custom installation client base. In many cases the yacht itself will not be used more than just occasionally and this immediately brings two requirements into play. Firstly it is unlikely that the owner, or their staff, will have anything more than a general understanding of what they want or can be offered, other than wanting the very best. Secondly, it must be straightforward and intuitive to use on a very irregular basis and will be used by a variety of guests who will not expect to need training. These requirements immediately affect the initial specification of the total system.

Gerry Heeley of UK-based Custom Connexion International, specialises in

providing consultancy to owners and their representatives in the early stages of a project: "Historically, the shipyards have offered turnkey solutions for yacht builds, which has included initial specification and installation of AV systems through subcontract installers. This has led to limited choice and flexibility for the owner, although it has meant that a seamless installation takes place as installers are pre-selected and have often worked for the yard before."

Consequently, he says, that the systems offered are often those that the supplier may be familiar with, rather than what the owner actually requires.

"An alternative is for the owner, or their representative to employ a consultant to provide the initial specification, following which the job can be put out to tender to qualifying installers. This benefits the owner in producing a solution that is better suited to them and will trim the overall cost by means of economical component selection, as well as ensuring a future upgrade path."

Liaison with the owner during the early design stage, and the problems associated with it are endorsed by Neil Harris, Managing Director of Harris Grant Associates who have completed many mega-yacht installations in recent years: "It is often very difficult to obtain access to the owner, particularly at the start of the operation; they are often reclusive and may be based abroad, well away from the yard and suppliers and contact is often through a representative or the ship's captain. But a much happier result is possible whenever direct contact is achieved."

No matter how complicated the system is in the background, nor how many independent processes it will control, the over-riding philosophy is that it must remain simple to use. "The emphasis for a successful installation has to be on simplicity and functionality. Whatever it can do there is always a need for basic functions; 'Where do I plug my iPod in?' is a common question and you had better be sure that there is somewhere to do so."

## Space, weight and power restrictions

Space, weight and wiring restrictions onboard have more impact than shore-based





installations and greater knock-on effects. There is generally a requirement for a greater level of integration for total solutions on yachts than in houses and many more systems are forced to share more limited resources. So the audio visual aspect is just one part of a total solution, with other services such as lighting, environmental and curtain control added in the normal custom installation way. But with marine installs, this goes further, extending to provide public address, weather information, external cameras, navigation plotters, videoconferencing, satellite links and data communications grafted onto a common substructure. So any system that allows combined services to be provided is seized upon. One implication of this is in the development of the user interface. AMX and Crestron provide, as with home installations, the majority of control equipment. Cliff Stammers of Oxberry Ltd provides programming services for Crestron control systems and specialises in marine

applications. He says he has to work with the conflicting demands of greater system complexity versus simplified operation.

"It isn't that there are new functions on superyachts as much as their diversity and quantity that causes problems and the scope for interaction between them to adversely affect the operation of the complete control system. On top of that we have to design a simple user interface that is as easy to operate as possible whilst having little or no access to the end user, and with the best will in the world, differences in interpretation will occur." And these are often not identified until the system is operational, he says. "By which time the vessel may be at sea, so you might end up flying half way around the world to change a minor aspect of a control menu, for an owner who is very, very demanding. Fortunately it is now possible and commonplace to have remote access that allows minor changes to be made through satellite links directly to functioning equipment onboard."



## 'Allowance should be made to add new components and transmission networks as and when they become available'

Martin Noar, Libra Solutions

### Network development

In European homes and offices, the standard European Installation Bus (EIB) network is being installed more frequently. This, together with its successor, the Konnex KNX bus, provides a common interface and connection mechanism for a wide variety of electrical components and is used widely in superyacht designs. This provides communication between motors, sensors, contactors and many other types of device, with the advantage of being able to operate over a variety of networks, including twisted pair wiring, Ethernet and wireless. A further and more significant advantage is that EIB and KNX offer the ability for comprehensive remote access. It is now possible to gain access to a yacht and to monitor all aspects of the installed system, meaning that the control system, custom installer or operator can interrogate each and every aspect of the system to check its operational state – right down to whether a door is open or shut, the vessel's exact location and prevailing windspeed and direction.

This in turn, allows features of the installation to be adjusted automatically or manually. Lights may be switched on as a guest enters a room to a different level depending on the time of day, or a warning sounded for open doors in the event of an approaching storm. Harris Grant is one of the few integrators who have installed fully remotely-accessible EIB networks, says Neil Grant: "We have heard for years about integrators who claim to have installed systems that allows them to offer remote access on land based installations. This is something we have achieved successfully on ship-borne systems and we can fully control every aspect of a system from our office in the UK, wherever the boat is at the time. This is an enormous benefit in instantly identifying faults and operational irregularities, and providing fixes and system updates without waiting for the boat to go into port or inconveniencing the owner or guests." Arthur van Berge Henegouwen of

Van Berge Henegouwen also considers remote access critical: "A superyacht may have many hundreds of separate electronic devices which have to be managed by a small crew," he says. "No matter how specialised and capable they are, it is impossible for them to be expert in everything, and they have to solve every problem at sea with no recourse to external test or repair facilities. Devices that are remotely accessible, such as Kaleidescape servers which can monitor and report the health of RAID arrays and repair themselves during operation, as well as Crestron's power amplifiers that have temperature and status sensing, go a long way to allowing us to diagnose and forewarn the crew wherever the yacht is in the world, and to arrange a replacement unit for the next port of call if necessary."

### The same: but different

In many respects the audiovisual aspects of superyacht installations are similar to homes in that the both applications have a need to distribute and manage the highest quality video and audio signals to multiple locations. Composite video and stereo audio are non-starters. The minimum specification for a distribution system is at least component video and 5.1 surround sound, which, in turn, calls for extensive and complex wiring; something that has cost and installation considerations.

There is usually a central equipment and communications room where a large percentage of the equipment is located, together with control and conditioning equipment. In a home installation, it is reasonably simple to identify an area where this can be located, and space is not normally an issue, so equipment can be changed and added to - not so on board. A yacht with 25 to 30 separate displays points (cabins, salons, decks, dining rooms and so on) is not unusual and each one is likely to have its own full set of satellite receiver and Kaleidescape player, together with ship-wide DVD, VCR and music players. This can result in 6 to 10

full size racks of AV equipment, perhaps with an additional couple of racks in the hold or bilge awaiting swap-over as the yacht moves location and TV standard.

E3Systems' Horner comments, "Every inch of the vessel is considered and planned and allocation of space is a very exact science. Space, weight and power consumption are scarce resources which must be calculated at an early stage, and the local addition of equipment after initial installation is not usually an option. For this reason as much equipment as possible needs to be located in a central area."

Additionally, it has to be supplied by good quality power conditioning; raw power supply voltage and frequency on board fluctuates greatly and is subject to excessive amounts of noise and spikes as shore power is connected and bow thrusters operated, he notes. "We have seen many, many examples of control system failure caused as a direct result of 'dirty power'. Superyachts, by their very nature tend to operate in hot regions of the world. Good air conditioning is standard and essential for the continuous and high reliability operation of equipment. However space is extremely limited and equipment is often shoe-horned into limited and badly ventilated compartments, so we have to pay particular attention to heat removal."

### **Cabling and SDI**

One of the major issues on yachts of any size is cabling, in particular the cost and complexity of initial installation and fit-out. Retrofit of cables after that point is often impossible, so mistakes can be disastrous. Shipyards can, and do, charge installers to prepare and route cables around a hull. The cost of installation usually exceeds the value of the cable itself, and the cost can be extremely high. So systems that minimise the



amount and number of cables required are an advantage and as the world moves toward network based distribution of all types of signals, the requirement for multiple cable types falls. However that point has not yet been reached and leading-edge technologies of today utilise multi-connection analogue, coaxial and CAT5 cables. With the addition of fibre, vessels will generally be built with a core set comprising a selection of at least one, ideally two or more of each type running from the central communications area to each point of audio and/or video consumption, whether that is a cabin, corridor or sun deck.

Martin Noar of Libra Solutions has recently completed the installation of a multichannel AV distribution system on 217-footer superyacht, Triple Seven, using Vutrix's VuSwitch AV distribution system. "This converts any form of video and audio signal to the broadcast standard SDI format. There is no loss in picture quality, and both audio and video signals are embedded onto the same data stream."

Once converted, the signals are routed and distributed around a vessel using standard CAT5 cable to receiving points where they are converted back to the desired

video and audio levels. The major advantage of the VuSwitch system lies in the quality of the transmitted image using a single easily installed cable, rather than multiple cables. "A digital signal transmitted over twisted pair wiring it is not prone to errors or corruption," he says, "nor is it affected by differences in cable lengths that require differential compensation, as is encountered in analogue component distribution. It is not necessary to convert all signals to a common format such as composite or component prior to input to the router. Switching of the combined audio and video



## 'A superyacht may have many hundreds of separate electronic devices which have to be managed by a small crew'

Arthur van Berge Henegouwen

stream is straightforward with a large 32 x 32 matrix controlled from a standard control system such as AMX or Crestron using an RS232 interface."

### The problems of planning ahead

Given that a superyacht typically takes three years to progress from drawing board to actually entering the water, it is crucial that the design and specification remains flexible throughout that period, says Martin Noar: "Whilst system integrators will inevitably err on the side of caution in selecting stable and reliable products, the development and release of new versions of products and even whole new product ranges and technologies, means that a design that is formulated at the beginning of a project may well be out of date at the time the equipment is installed and commissioned. Specifiers of systems, whether they are independent consultants or systems integrators, must therefore allow sufficient movement in the design of their customised and highly bespoke creations to easily and simply accommodate the next generation of must-have technology. That is not to say that design should be left to the last minute, rather than an allowance should be made to add new components and transmission networks as and when they become available."

### Preparing for IPTV and HD

Two such technologies appearing on the horizon are IP distributed video and High Definition TV. Although both have been around for some time, their impact and effect has yet to be fully felt in all of the custom installation markets.

HD TV goes against the core philosophy of centralised support and service distribution, says Arthur van Berge Henegouwen. "As plasma and LCD screens

become larger; the standard installation sizes on superyachts has now become 50" to 64", with at least 5.1 sound, and the quality of the source is paramount. High definition video is beginning to be a standard fitment with players local to the display. The HDMI output on these devices is a severe problem, as long distance transmission - anything over 30 metres or so - is expensive and fraught with problems, requiring two CAT5 or four fibre cables per single point-to-point link."

Currently it is not possible to distribute content-protected HD content over matrix routers and long distances without considerable effort and expense. Manufacturers are addressing these issues but no viable solutions have yet emerged. In addition there is limited HD content available in the form of transmitted or recorded material, and even that is questionable as to its true HD format; all broadcast HD programming is compressed to a certain level, as is recorded material. Eventually uncompressed HD video will be available and it is part of the complete design process for entertainment systems to prepare to accommodate this.

IPTV is emerging as a candidate solution for distributed entertainment systems but is not yet at a serviceable state, as Roger Horner, explains. "IPTV is a great solution for remote access to worldwide TV material, but with a VSAT bandwidth of 1 - 2 Mb for all data services it is really only viable for low rate content. 250Kb streams are adequate to provide home-country news and sports programmes that can be provided on a store-and-forward basis, perhaps augmented by a Sling Box or equivalent. However it is likely to be at least five years before a fully operational IPTV system becomes viable on superyachts. We are watching and testing developments in this field with great interest." **RSE**