Controls Retrofit

Holland-Controls owns key competence in control systems for gas turbine installations, reciprocating engines, steam turbines, station control systems and power management systems.

Turn-key controls retrofit

Retrofitting of existing control systems is one of the important areas of expertise of Holland-Controls. Control systems have a tendency to age faster than the equipment it is controlling. Holland-Controls offers various levels of control system upgrades (retrofits) to suit your needs.

- **Customized engineering**
- **Support on various control platforms**
- **ISO 9001/14001/45001 certified by TÜV**
- **CE, ATEX and SIL compliant**
- **Excellent documentation and support**
- **Experienced and dedicated team**

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After the system has proven itself follows a period of 10 to 15 years with few problems; thereafter the mortality rate goes up again. This typically means systems start to fail when support and components are no longer available for that product.

The consequence is that one must make a choice: either invest heavily in spare parts and know-how on site –or– ensure that systems are being modernised before the end of the life cycle.

Note that the 'amplitude' of the curve strongly depends on mechanical stress, thermal stress, corrosion and complexity of the system. A good cooling system (ventilation) helps to lower the failure rate, yet it will not alter the shape of the curve.

3. Technical advances in new systems

As time goes on, improvements are being developed. Whereas for the mechanical part the advances are steady, control systems have made quantum leap improvements compared to systems of 15 or 30 years ago. Control systems only cost a fraction of the mechanical part and will save you money when implemented correctly.
It is this combination which makes it so attractive to consider upgrading: the investment-effect ratio is very good.

Some of the advances are:

- Visualisation and trending of all engine parameters in a comfortable control room.

- No more missed events, no need for that spurious fault to re-occur to properly diagnose it. The order of events is accurate, leaving no doubt as to what came first. All data is stored and can still be analyzed months after the event. And can be compared with data of 1, 2 or 3 years ago, or longer if desired. All with a sampling resolution of 0.5 second or better.

- Discrimination of events is dramatically better. Whereas older systems may have one indication light saying that there is 'a' fault, current systems will point you exactly to the faulty device – further supported with a historical trend of that device.

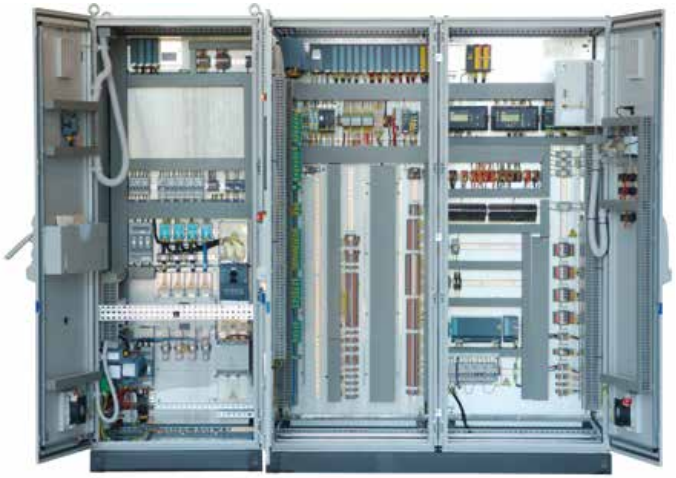
- For specific troubleshooting there is fast event-triggered data logging possible. Through steady R&D effort we managed to bring the scanrate down to 10 ms providing an extremely clear view on what really happened at processor scan interval.

- Current PLCs are much more accurate. High definition analog to digital conversion and self-calibration are the reasons for this. This makes it possible to operate engines closer to their limits – safely. Examples are exhaust gas temperature limit and compressor surge limit. You are less likely to burn an engine out. Or you can operate with one engine less because you know you are safely on that limit. Think of the savings in fuel cost and CO2 emission!

- More intelligence can be put in the control system if needed when compared with discrete systems. Changes are easy to program. For example stopping the engine with a cooling-down cycle instead of just cutting the fuel reduces the number of overhauls on your engine while keeping its performance. The gas compressor does not have to be depressurised on each stop saving on CH4 emission. It is not often when it is so easy to be green and save money.

- Availability can further be increased by adding redundant field instrumentation which is then processed by the CPU using intelligent voting. Notorious problematic sensors no longer shut you down.

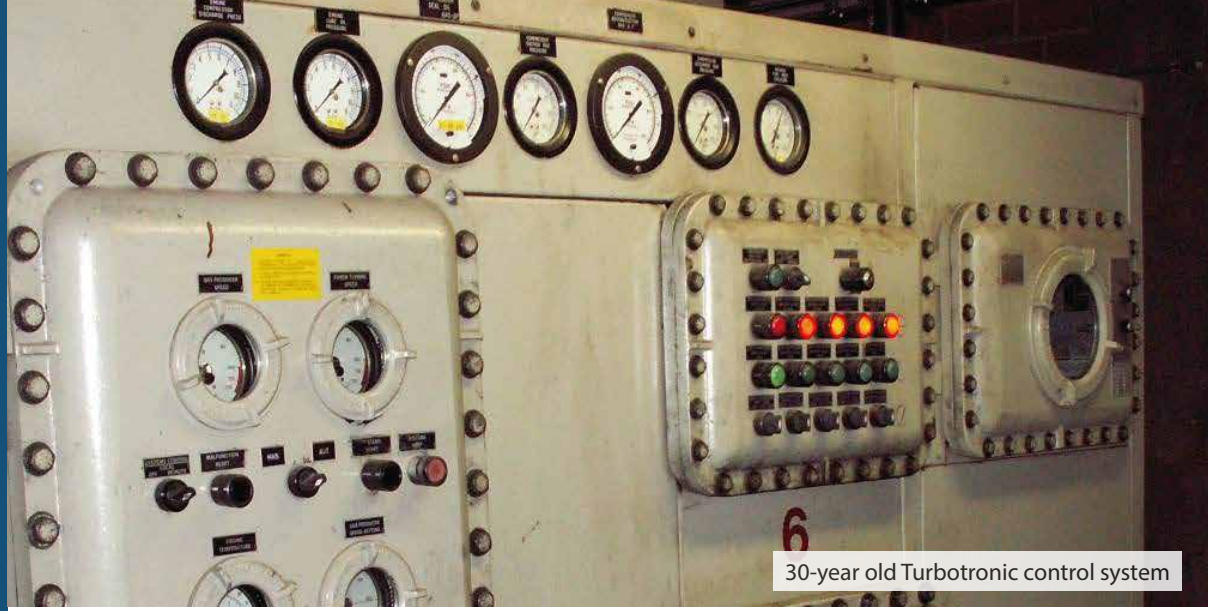
- Coupling to DCS or remote systems is easy to accomplish. There is no more need to limit dispatching with only a subset of the information available locally.



Reasons for upgrading

Some installations appear to run merrily for 30 years with the same system, whereas others are upgraded within 5 years of supply by the engine OEM, simply because it isn't doing the job right. The following criteria play a role in making the right decision:

- Criticality of installation
- Life cycle of existing system
- Technical advances in new systems
- Support
- Support by end-user
- Legislation



30-year old Turbotronic control system

1. Criticality of installation

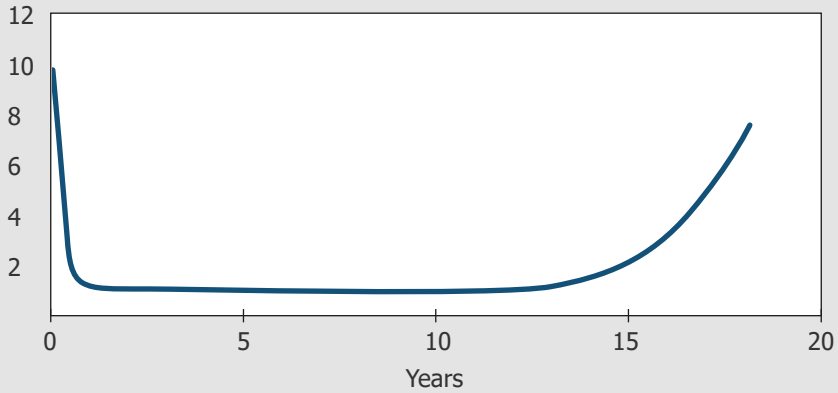
The level of criticality depends on the application the unit is in. Redundancy of engines is the most important parameter here. Most installations, when newly built, have one or two units spare. This makes it possible to do routine maintenance on one unit, running the remaining units and still have one spare in case of sudden mishaps. However applications change.

Offshore platform power generators tend to feed newly built satellite platforms. On gas compression stations the volume of gas being pumped increases every year. And with the free gas and electricity market the term 'running season' seems to be no longer applicable. The result is that the demand for availability of the installation increases year by year – while at the same time the true availability of the installation decreases due to aging.

The control system plays an important role in two aspects here:

- the availability of the system itself
- the quality of information it can provide to the operator about malfunctioning of the unit or system it is controlling.

The question to ask is: what is the financial damage if I lose a machine for production because a control system repair takes more than one month (availability spares, expertise, ability to identify root cause).



2. Life cycle of existing system

Any piece of electronics follows a life cycle curve roughly looking as seen on the left.

The initial failure rate (Y-axis) is commonly referred to as 'infant mortality rate' and occurs during the first half year. Through burn-in periods at the manufacturer, during in-house tests and through warranty clauses, this period is well covered.

4. Support

Most new engines come with a heavily standardised control system by the OEM. This control system does exactly what is needed to run that unit in the technology chosen by the OEM. The gas turbine or gas engine is their core business, the control system is the by-product.

Sometimes proprietary control systems are employed with partly inaccessible code. This means it is not possible to go elsewhere for support. As the system ages it becomes increasingly difficult to get support with only a small number of people left still having the know-how required.

Upgrading such a system typically means having to accept the current standard and hope that it will fit the existing application.

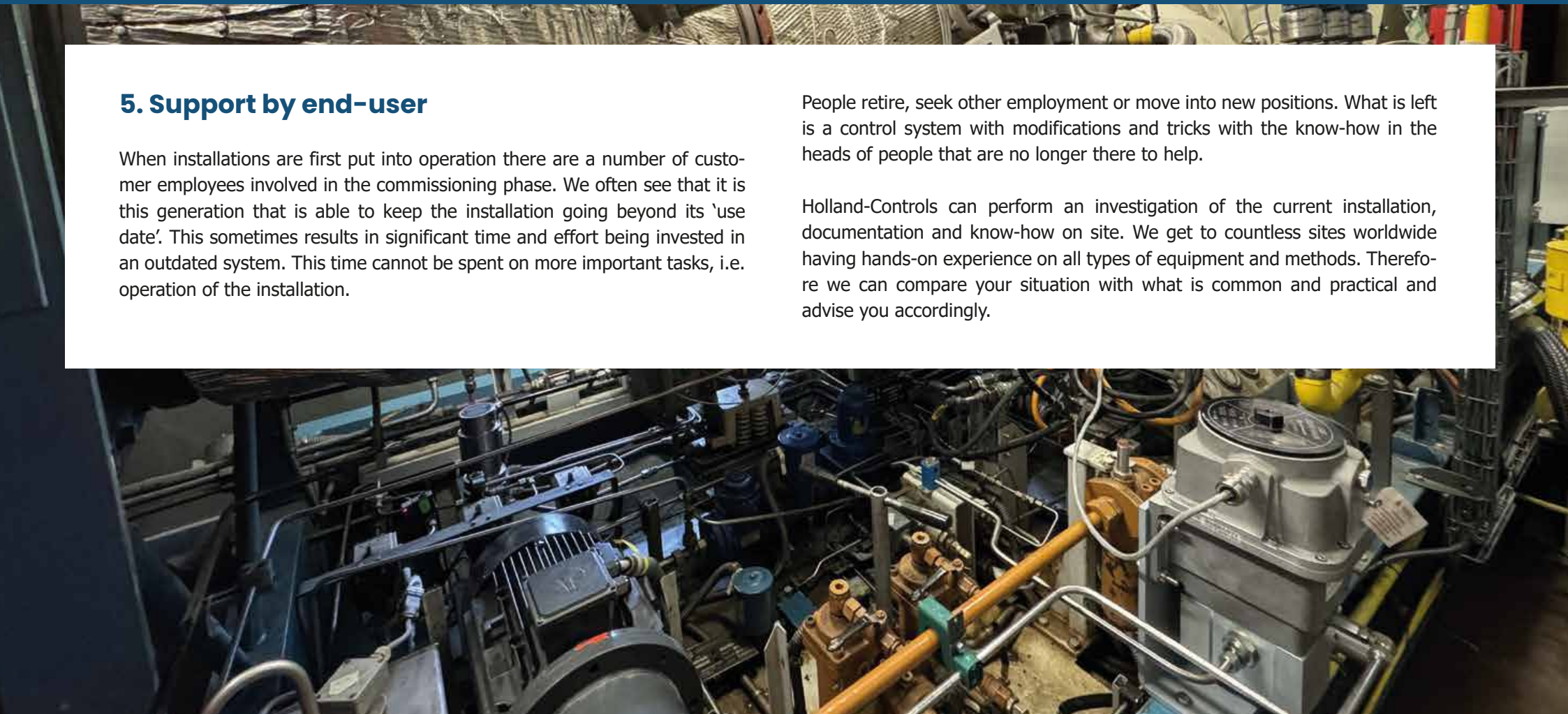
For Holland-Controls the control system is the core business. We offer upgrades in various technologies, but always using off-the-shelf components. Components that you may already use elsewhere in your plant. And for which you already have basic support know-how in house. And for which third party companies are able to provide extensions or specific solutions as well.

5. Support by end-user

When installations are first put into operation there are a number of customer employees involved in the commissioning phase. We often see that it is this generation that is able to keep the installation going beyond its 'use date'. This sometimes results in significant time and effort being invested in an outdated system. This time cannot be spent on more important tasks, i.e. operation of the installation.

People retire, seek other employment or move into new positions. What is left is a control system with modifications and tricks with the know-how in the heads of people that are no longer there to help.

Holland-Controls can perform an investigation of the current installation, documentation and know-how on site. We get to countless sites worldwide having hands-on experience on all types of equipment and methods. Therefore we can compare your situation with what is common and practical and advise you accordingly.



6. Legislation

Over the years legislation has changed. The rules and regulations below are relevant in this context.

Whilst these are specifically listing the European situation, the same applies globally whereby methodologies and standards are being harmonized more and more every year.

Legislation changed to improve transparency of the market, and to overcome flaws in previous local standards having resulted in accidents. It is allowed to continue using an installation if it was truly installed according to the legislation in place at the time. But it is not always wise to do so, as it makes it hard to carry out improvements on the installation without breaking the law.

With respect to the environment it is often better to demonstrate that a company is already taking its measures rather than waiting for the authorities to step in with law.

CE - European Conformity

Especially with regards to radiofrequency emission and susceptibility many older systems fail resulting in unnecessary shutdowns or operational inconvenience when using radios and such. Also outside Europe it makes sense to ensure equipment is CE-marked.

ATEX

This refers to the explosion hazard present in the gas turbine industry, and the approved technologies to overcome this.

PED

This refers to high pressure systems, for example transport gas, fuel gas and steam.

SIL

Safety Integrity Level refers to the level in which a system acts safe in case of malfunctioning in order to prevent injury or death.

CO/NOx

CO/NOx, CO2 and CH4 emission reduction measures through taxes and limits.

Scope of upgrade

Control system upgrades can take place in various shapes and formats. This depends on the criticality of the system involved, the money that can justifiably be spent on it and the competence already available on site.

Case 1: Limited upgrade

If a particular component is causing trouble, but the installation is not highly critical then Holland-Controls can ensure that only the troubled component is replaced. The picture above-left shows a section of an Allison KB-5 control panel for a non-critical backup generator. The speed & temperature controller was a 'black box' constantly causing availability problems.

Spare parts were no longer available. Holland-Controls has reverse engineered the functionality of the box. We installed a PLC-based solution with open code providing exactly the same functionality as the old controller.

Case 2: Control-system only upgrade

PLC manufacturers tend to obsolete their current systems every 10 to 15 years. Thereafter they are still supported with spare parts but at a significant cost and supply time. Also auxiliary components get poorer, relays start to demonstrate bad contacts, electronic converters hit the end of their life cycle by failing more frequent.

In case the instrumentation on the engine is sufficiently modern, then it is worthwhile considering to only upgrade the control system. The two common scenarios are:

• Replacement of backplanes. In this case the existing panel is stripped of all hardware except the field terminals. The new hardware connects onto the existing terminals.

• Full panel replacement. Through an extensive site-survey and design phase it is ensured that the existing cables will fit onto the new control system's terminals.

Case 3: Control-system upgrade & field modernisation

This is the most common of all. When a control system requires upgrading, then it often makes sense to also modernise the field instrumentation, for example:

• Replacement of the hydraulic fuel valve by an electric version (middle picture).

• Replacement of switch-type sensors (temperature, pressure, level) by analog types in order to dramatically improve the diagnostics capability of the system.

• Adding strategic, SIL-rated protection and redundancy previously missing.

Case 4: Full upgrade – Proven engines deserve reliable controls

Sometimes we see systems that haven't been touched for years. When the time has come to upgrade these systems then it is not possible to limit oneself to the control system only. Field instrumentation has meanwhile become completely outdated, field cabling is brittle, junction boxes are still of the heavy explosion proof type and so on.

In that case it is best to basically strip 'everything with a wire' such that after the retrofit the system is as new again as before the retrofit, but now to today's standards and practices.

Upgrades can be performed turnkey in which case Holland-Controls takes care of the complete spectrum through the following actions:

- Site survey and specification.
- Engineering and drafting of hard and software.
- Specification and writing of software and HMI.
- Building of the new control system.
- In-house control system test followed by a customer
- witnessed Factory Acceptance Test.
- Removal of old- and installation of new control
- system and instrumentation.
- Loop checking, system checks and start-up.
- Final handover & documentation.
- Training of operators and technicians.

Holland-Controls is also open to joint efforts as long as the scope can be clearly split. Many offshore platforms have maintenance contracts with a certain company. In such a case that company can take care of the installation aspect under Holland-Controls' supervision and procedures.

Summary

Reduce the cost of ownership of your current installation and talk to us before an upgrade becomes a matter of urgency. With a highly qualified staff, long term experience and structured project execution according ISO-9001, 14001 and 45001, Holland-Controls is your right partner.

For more details request our document GEN-0003 or check our website: **www.holland-controls.com**.