

A comparison between the sigPOD 1302 and a home-made process monitoring system based on off-the-shelf hardware components and software written in National Instrument's Labview. The table below summarizes the findings of this comparison.

| | sigPOD 1302 | DIY |
|---|----------------|----------------|
| Costs | | |
| Hardware Costs (design, sourcing, assembly, validation) | \$3,700 | \$2,796 |
| Software Costs (licenses, development, validation) | Included | \$4,670 |
| Total Solution Cost | \$3,700 | \$7,466 |

| | sigPOD 1302 | DIY |
|--|-------------|------|
| Complexity | | |
| Supply Chain: | | |
| Number of different manufacturers supplying components required to assemble solution | 1 | 5-10 |
| Supply Chain: | | |
| Number of purchased items/components required to assemble solution | 1 | 10+ |
| Fully assembled and integrated out-of-the-box solution | ✓ | - |

| | sigPOD 1302 | DIY |
|---|---|------------------|
| Robustness | | |
| Industrialized packaging suitable for a manufacturing environment | ✓ | - |
| Operator-friendly touchscreen interface | ✓ | - |
| Robust, fully tested and validated software | ✓ | ? |
| Flexible, intuitive software application design, based on thousands of hours of development and tested by hundreds of users | ✓ | - |
| Support infrastructure | Sciometric Customer Service, Sciometric R&D | Single Developer |

For some manufacturers, the option of developing an in-house process monitoring solution based on a personal computer, a data acquisition card, a few additional hardware components, and a home-grown software application may appear to be an attractive option. However, this is based on the misperception that such an approach will result in significant cost savings versus a commercial, off-the-shelf solution such as Sciometric's sigPOD 1302 with PSV and Press software. With the sigPOD 1302 selling for a list price of just \$3,700, the fact is that this is almost never the case. This is primarily because of the many hidden costs buried in the design, development, procurement, assembly, test, and validation of a home-grown solution.

To fully illustrate the difference between the home grown solution and the Sciometric solution, let's start by considering the material costs. To put together a complete solution requires much more than just a PC and a data acquisition card. Signal conditioning hardware is required to enable the system to properly read encoders and handle industrial digital I/O levels.

The Hidden Costs of DIY

- system design
- supply chain management
- assembly and test
- software application development
- system validation
- Labview license
- support



Table 1 below illustrates the various components that are required to put this system together.

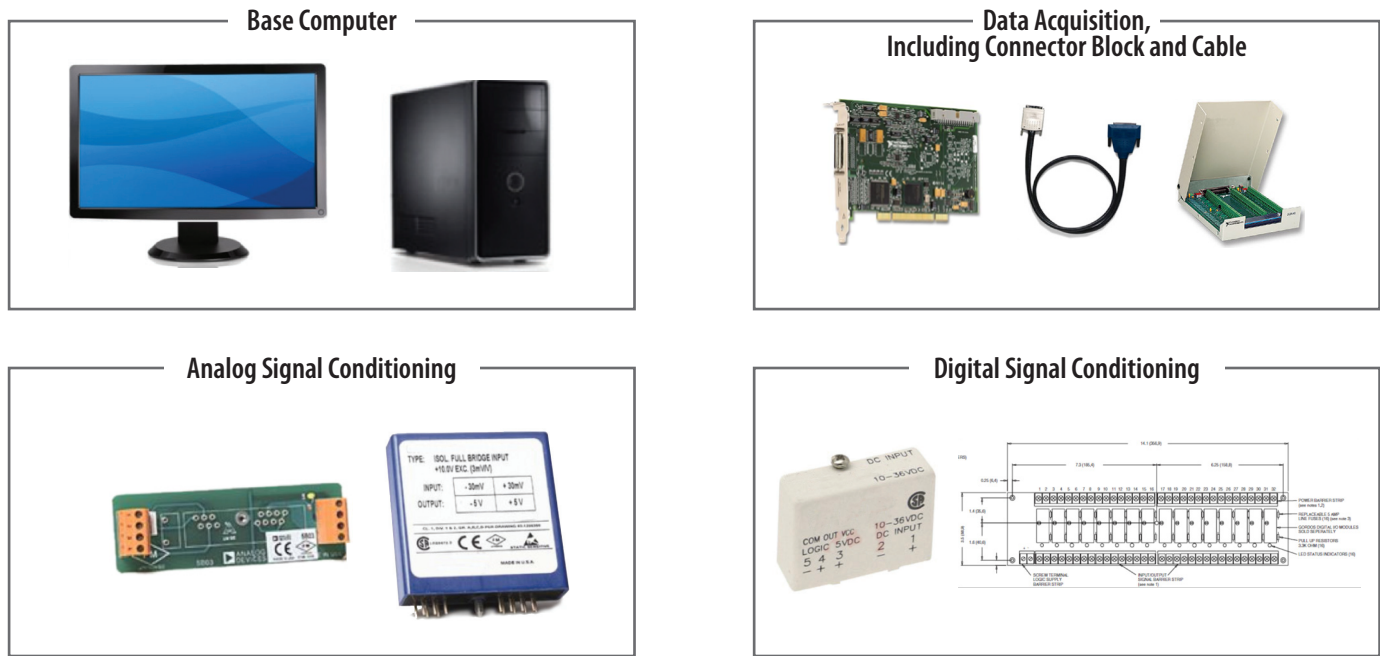


Table 1: Hardware components of home-made solution

Table 2 contains the costed bill of materials (BOM) for the in-house solution. Instead of purchasing just a single item, as in the case of the sigPOD, the assembler now has to deal with 10 major components, as well as the various fasteners and other hardware that will be required to put this system together.

| Description | Cost | Quantity | Ext. Cost |
|--|----------------|----------|----------------|
| Desktop Computer – 2.2GHz, 2GB RAM, 320GB HD | \$280 | 1 | \$280 |
| 18.5" W HD Monitor | \$130 | 1 | \$130 |
| 8 CH Ain, 16b, 250 kS/s, 2EI, 24 DIO | \$519 | 1 | \$519 |
| Connector Block | \$319 | 1 | \$319 |
| 2 meter cable | \$139 | 1 | \$139 |
| Base H/W System | \$1,387 | | \$1,387 |
| <i>Signal Conditioning for Encoder and Digital I/O</i> | | | |
| 16 Channel P&B Module holder | \$159 | 1 | \$159 |
| Digital output 5-60 VDC 3A | \$13 | 8 | \$103 |
| Digital input 10-36 VDC | \$16 | 8 | \$128 |
| 1 Channel holder board | \$44 | 2 | \$88 |
| Analog input Bridge | \$165 | 2 | \$329 |
| Total Signal Conditioning | \$397 | | \$809 |
| Total Hardware | | | \$2,196 |

Table 2: Costed bill of materials for home-made solution

From a purely hardware cost perspective, it appears that the home-made solution is substantially cheaper than the sigPOD's list price of \$3,700, at an approximate savings of \$1,500. However, this does not include the hidden costs of designing the system, procuring the materials, assembling the system, testing and validating the hardware. Table 3 below totals up these additional costs based on the assumption that the average fully loaded labor rate for the engineers and operations personnel involved is \$75/hr.

| Description | Hours | Rate (\$/Hr) | Ext. Cost |
|--|-------|--------------|--------------|
| System design | 2 | \$75 | \$150 |
| Sourcing - identifying suppliers, obtaining quotes, placing orders, tracking inventory | 3 | \$75 | \$225 |
| Assembly and test | 1 | \$75 | \$75 |
| Validation | 2 | \$75 | \$150 |
| Total Hardware Assembly | | | \$600 |

Table 3: Hardware assembly costs

At this point we have considered what it takes to create the hardware system, but have yet to include the costs associated with the software. This is perhaps one of the most contentious pieces of the equation. A simple application, purpose-built to address one specific, straightforward application, may take only one or two weeks of development and validation time – however, this is truly the bare minimum. With so little investment, there is significant risk that this application will not be robust, or efficient enough to be ready for deployment on the manufacturing floor. However, even in this barebones case, the development cost is estimated at \$4,200, as shown in Table 4.

| Description | Hours | Rate (\$/Hr) | Ext. Cost |
|-----------------------|-------|--------------|----------------|
| System design | 4 | \$75 | \$300 |
| Code development | 40 | \$75 | \$3,000 |
| Validation Testing | 8 | \$75 | \$600 |
| Documentation | 4 | \$75 | \$300 |
| Total Software | | | \$4,200 |

Table 4: Software development costs

In many cases, such applications can actually take months of architecting, code development and validation testing, driving the development costs well into the tens of thousands of dollars. This is one of the key advantages of choosing a ready-made application such as Sciometric's sigPOD Press or PSV – applications that are the result of thousands of man-hours of research, development and testing. This ensures that the interface is logical and easy to use, that the code is robust and well-designed, and the data is accurate and repeatable. Sciometric's applications also include many additional features, such as a comprehensive suite of statistical analysis tools, support for a wide range of fieldbusses, data storage and archiving utilities, among others – which are unlikely to be included in a hastily compiled home-grown application. Furthermore, such applications are typically authored by a single engineer who is then the only person capable of supporting the application or providing future updates or improvements. With a commercial application, an entire company stands behind the product, ready and available to provide support.

The Perils of Home-Grown Software

1. Development costs generally far exceed the price of an off-the-shelf product
2. Less robust, more prone to bugs and crashes
3. Design likely based on input from just a handful of people (perhaps just one!), while a commercial application benefits from input from hundreds or even thousands of users
4. Often take a “quick and dirty” approach to keep development time to a minimum, whereas a commercial application is developed over the course of thousands of hours and many, many iterations
5. Keeps a valuable resource tied up with something that could be accomplished earlier, better and more cost effectively
6. Only one person in the world who knows the code and can support it

The True Cost of DIY

Comparing the real costs of the sigPOD 1302 and a home-made process monitoring system

The final element is the cost associated with the software development environment. The cost of a LabView Developer Suite license is \$4,699. In some cases this may be amortized across multiple applications, so for the sake of this calculation, we will assume that it is amortized over 10 applications, for a contribution of \$470.

When we add up all the costs associated with the hardware, the hardware assembly, the software development, and the LabView license, the total comes to **\$7,466**, as shown in Table 5 below.

| Description | Ext. Cost |
|---|----------------|
| Hardware BOM costs | \$2,196 |
| Hardware assembly costs | \$600 |
| Software Development costs | \$4,200 |
| Labview Developer Suite License (amortized) | \$470 |
| Total Solution | \$7,466 |

Table 5: Total system costs

Let's compare this against the total cost of the Sciometric solution. Table 6 shows the breakdown for the sigPOD 1302.

| Description | Cost | Qty | Ext. Cost |
|--|----------|-----|----------------|
| sigPOD 1302T – 2 channel Process monitor. Features one (1) encoder input, and eight (8) digital inputs, eight (8) digital outputs. | \$3,700 | 1 | \$3,700 |
| Assembly and test | Included | | \$0 |
| Touchscreen display | Included | | \$0 |
| Application software | included | | \$0 |
| Total Solution | | | \$3,700 |

Table 6: Software development costs

Based on this total cost, we find that what initially appeared as a much cheaper solution, **ends up being more than twice as expensive**. Furthermore, there are significant shortcomings to this solution, which if addressed would further drive up the cost. First of all, the combination of a desktop PC and various small boards and modules is not properly packaged for a crowded, possibly dirty manufacturing environment. Cabling, mounting, protection from the environment may all need to be addressed and can add significantly to the hardware costs. Second of all, as mentioned previously, the software application will not be of the same calibre as the commercial applications that come with the sigPOD 1302. Finally, the home-made solution relies on a keyboard and mouse for its user interface, while the sigPOD comes with an integrated touch-screen display, which is much better suited to a manufacturing environment.

In summary, this exercise illustrates that it is important to consider all of the hidden costs associated with an in-house solution – looking just at the direct material costs will dramatically underestimate the total cost of the solution. In this day and age where resources are tight, manufacturers can ill-afford to pay thousands more for a solution that doesn't quite measure up.

TALK TO SCIOMETRIC ABOUT YOUR APPLICATION.



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