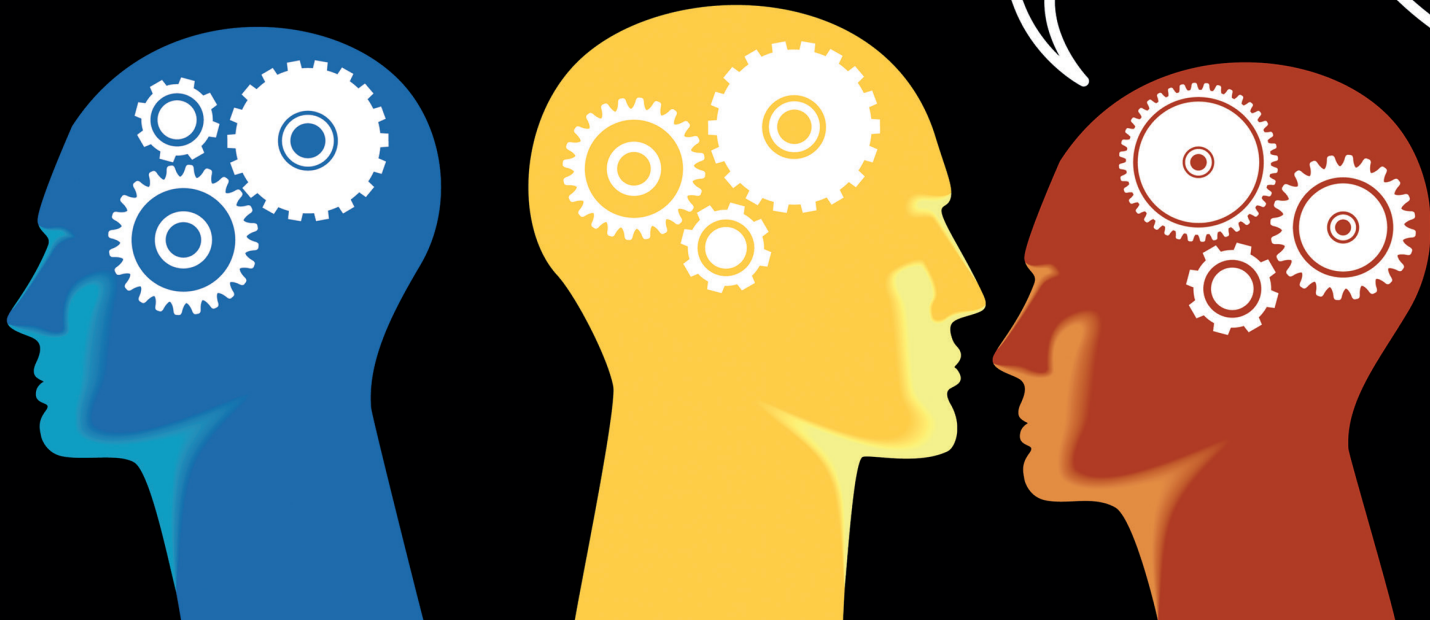



Sharing FOR SUCCESS

Brad Wood, Juran Benchmarking, UK, and Fernando Santamaria Estepar, Enagás, Spain, reveal how benchmarking can be used to improve the operational performance of LNG terminals.





In 2012, a group of European LNG receiving terminal operators established a consortium in order to benchmark their operational performance and learn from industry leading practices. Since its inception, the consortium, which is independently facilitated by Juran Benchmarking and has participation from leading European terminal operators, has worked together annually to collaborate under a mutual confidentiality agreement.

Objective

The group was established with the objective of developing a suite of key performance indicators (KPIs) that would provide them with the foundation to compare their performance in terms of operational efficiency and effectiveness.

As the benchmarking is facilitated by a third party, the participating terminal operators are able to share and analyse data in a confidential environment. In so doing, terminals can identify and quantify gaps in their performance and understand their strengths and weaknesses compared to their peers.



The scope of the benchmarking includes a detailed analysis of both the efficiency and effectiveness of terminal operations, maintenance and related support functions (Figure 1). Efficiency considers OPEX for manpower and materials, as well as manpower time expended. Costs and manpower time for each terminal are analysed for each performance-driving area, including the following:

- ▶ Operations.
- ▶ Maintenance.
- ▶ Functional support services.
- ▶ Energy consumption.

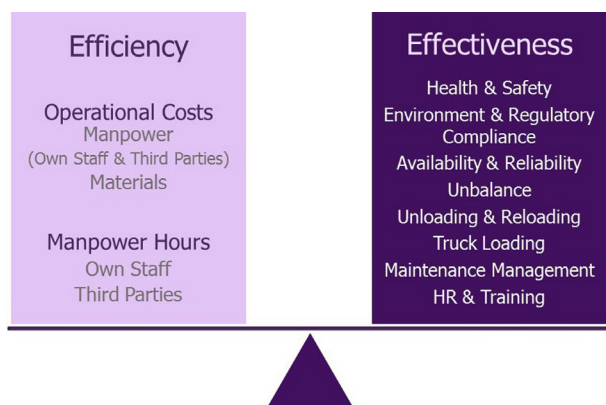


Figure 1. The benchmarking scope.

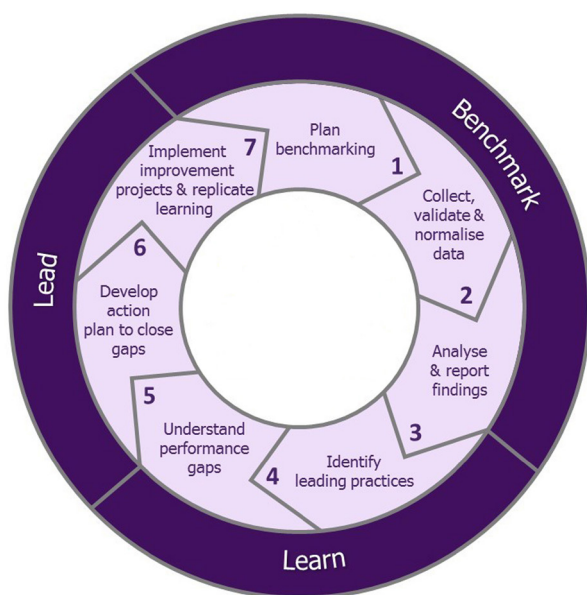


Figure 2. The Juran Benchmarking Cycle[®].

Performance area	Change in performance (2012 – 2015)
Terminal utilisation	38% decrease
Terminal send out	44% decrease
Number of vessels unloaded	25% decrease

Effectiveness is determined by a suite of KPIs reflecting the quality of outputs, including health, safety, environment, availability, reliability, integrity and maintenance management, etc.

Performance analyses are made between terminals and performance gaps determined. The process follows the Juran Benchmarking Cycle[®] (Figure 2), which provides a robust, systematic approach, commencing with benchmarking planning, through data collection, validation, analysis and reporting. The output of this analysis enables improvement opportunities to be targeted, whilst formulating appropriate deployment activities in order to implement change and realise improvements in performance.

Like-for-like comparison

Central to effective benchmarking is the need to be able to compare different processes, functions, or, as in this case, LNG receiving terminals on a like-for-like basis. No two terminals are the same, so it is essential that an appropriate methodology is used to account for the differences so that valid performance comparisons can be made. If this is not achieved, then any subsequent analysis is of limited value. To enable this, it is necessary to normalise performance data in a way that allows like-for-like comparisons.

One approach often seen is to use volumes of send-out gas or terminal capacity as normalising factors. However, these are crude approaches and there is no correlation between them and either expenditure or manpower time. Therefore, a unique and innovative methodology was incorporated that enabled like-for-like comparisons of costs and manpower levels between terminals of differing size and design – the Juran Complexity Factor[®], which is based upon the technical complexity of a terminal and the corresponding effort required to operate and maintain it. The methodology has an excellent correlation with both OPEX and manpower time and, therefore, provides a robust methodology for enabling direct comparisons of different terminals.

Operational context

Global changes in the LNG market have resulted in a marked impact on the operating environment of European LNG receiving terminals during the four years that the consortium has been working together. Table 1 illustrates the average changes in terminal utilisation, send-out volumes and vessels unloaded between 2012 and 2015, based upon data obtained from the participating terminals. The reduction in utilisation has seen natural gas send-out volumes fall to minimum levels, bringing with it significant challenges both technically and commercially. All terminals recognised the need to minimise cost, whilst adjusting to new operational envelopes with minimum delivery, which became a key focus for the consortium in the initial years.

Rising to the challenge

The participating terminals have used the benchmarking to support them as they strive to meet the increasing challenges of operating during these difficult times. The comparative measurement of efficiency conducted in the benchmarking enabled the identification of cost gaps and savings potential for each participating terminal, should

they improve their performance to match that of the leading companies. This has resulted in cost savings for many terminals. Table 2 shows average changes in cost performance for the benchmarking group from 2012 to 2015. Overall, a significant decrease in total OPEX of 11% was observed, with a similar saving in maintenance and a larger saving of 29% in functional support services (health, safety, security, environment and quality (HSSEQ), engineering and laboratory). Only in the area of operations was there a minimal increase in cost performance during this period, which may be expected given the ongoing regulatory requirements for minimum manning levels in this area, thereby limiting opportunities for cost reductions.

The aim of any terminal is to be strong in terms of both efficiency and effectiveness. All companies want to maximise the quality of their outputs, whilst optimising cost and manpower levels. Thus performance in areas such as health, safety, environment, integrity availability and reliability all carry equal importance to operating efficiently. The relative effectiveness and efficiency performance of each of the benchmark terminals is shown in Figure 3. The quadrants, depicted by median performance levels, determine the strategy that each terminal should adopt for improvement. The objective of the benchmarker is to attain a leading position where both effectiveness and efficiency performance are optimised (upper right quadrant). Figure 3 also shows the improvement journey of one terminal (Company B) from 2012 to 2015, as it learnt from the benchmarking and acted upon the findings of the analysis to deploy improvement projects and realise step changes to performance. During this period, it achieved total cost savings of 20%, whilst maintaining terminal availability and reliability at 100% and halving the number of overdue work orders.

The benchmarking indicated that expenditure on contractors at one terminal was particularly high. Acting on the findings of the benchmarking, the company was able to realise significant cost savings. It examined ways in which its reliance on third party contractors could be reduced through utilising its own staff wherever possible. It also reviewed key contracts and established long-term contracts with selected vendors, thereby reducing hourly rates.

Another terminal discovered that the manpower time spent on operations was well above many of the leading terminals. It assembled a multifunctional improvement team, including personnel from maintenance and safety and identified more than 20 maintenance tasks that could be conducted by operations staff. In so doing, it was able to absorb over 1700 man-hours of maintenance time into operations, which, in turn, not only realised a cost saving, but also more effective completion of the tasks.

Maintenance efficiency was the focus for a third terminal that achieved y/y improvements resulting in a 14% improvement in manpower productivity over a 4-year period, through the introduction of a totally revised maintenance strategy. An organisation was put in place, centred around an asset management philosophy compliant with ISO55001 and with a risk-based approach. The resulting increased focus on maintenance programming, supervising and quality control enabled the company to execute the work with fewer resources.

Table 2. Performance averages for the benchmarking group

Performance area	Change in performance (2012 – 2015)
Terminal total costs	11% decrease
Operations costs	3% increase
Maintenance costs	11% decrease
Functional support costs	29% decrease

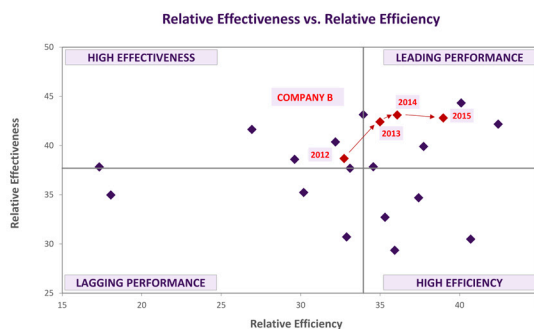


Figure 3. Comparing terminal efficiency and effectiveness.

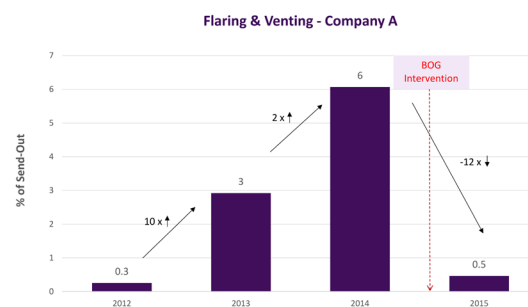


Figure 4. Patterns in flaring and venting at one terminal from 2012 to 2015.

It is not only about cost

Whilst attaining a cost leadership position is an objective of most terminal operators, it is also essential to ensure that performance is as effective as possible. One of the benchmarked terminals discovered that its maintenance planning was not as effective as its peers'. In order to gain better control, it introduced some of the KPIs used in the benchmarking into its maintenance management system and, as a consequence, was able to measure its maintenance backlog more accurately, resulting in more accurate maintenance planning compliance. Another terminal recognised that it had increasing levels of flaring y/y (Figure 4) as a result of increased boil-off gas (BOG) caused by minimal send-out levels. Through the sharing of best practices amongst the group, the company was able to learn from the other benchmarkers to identify technical improvements that could be adapted and adopted at

its terminal. As a result, it implemented interventions that significantly reduced BOG generation, which, in turn, not only cut flaring back to levels previously seen in 2012, but also significantly reduced lost energy and therefore realised cost savings. The benchmarking has, therefore, not only been an invaluable lever in determining improvements, but also provided an excellent mechanism to verify the impact of changes made.

More than just measurement

As the group has developed and the benchmarking has become more sophisticated, their activities have extended far beyond standard comparisons of performance using KPIs with the implementation of a number of knowledge sharing approaches.

Firstly, they established a platform for sharing leading practices in the form of a facilitated workshop where the leading performers made presentations to the group detailing the processes and systems they have in place that enable them to achieve their leading position. Other presentations may also describe innovations that terminals have developed or address areas of growing concern to the group. The concept is that all participating terminal operators will leave the workshop with some learning points to take back to their respective organisations.

Secondly, an alternative approach was developed to examine differences in working practices relating to the operation and maintenance of critical equipment in order to understand the impact of these upon performance. Low

pressure pumps were the first equipment type to be investigated. A detailed data collection tool was developed to capture the key elements of each terminal's practices, which were subsequently analysed to understand reasons for any differences and to identify leading practices.

Finally, all consortium members are free to instigate detailed targeted surveys amongst the benchmarking participants to investigate current challenges being faced in more detail and in real time. Surveys conducted to date have included maintenance management, emissions reduction and provision of firefighting services. These surveys allow for rapid dissemination of information amongst the group and are particularly useful when a given terminal needs to address a topic in a short timeframe. Furthermore, for some operators, implementing such surveys negated the need to engage consultancy support to achieve the same outcome, thereby realising further savings.

Conclusion

In a context of the major changes being experienced in the LNG market, the inevitable downward pressure on terminal operating margins and the associated challenges this brings to terminal operators in Europe, it is clear that the activities of this benchmarking consortium have enabled the participating operators to rise to these challenges by realising significant improvements in performance through the delivery of innovations and leading practices. **LNG**