

SAFER SMARTER GREENER CASE STUDY

Project to Improve Safety Management
at PT Badak NGL

Rev. 2, 2013-12-19

| | | |
|--|---|---|
| <i>Report title:</i> Project to Improve Safety Management at PT Badak NGL | | DNV GL Highbank House Stockport, SK30ET United Kingdom Tel: +44(0)161 477 3818 Fax: +44(0)161 477 3819 http://www.dnv.com Org. No: GB 440 6013 95 |
| <i>Customer:</i> | PT Badak NGL | |
| <i>Customer Address:</i> | PT Badak NGL Bontang East Kalimantan Indonesia | |
| | | |
| <i>Prepared by/Contact Person:</i> Chris Urwin | <i>Position:</i> Associate Director, DNV GL, United Kingdom | |
| <i>Reviewed by:</i> Eric Kaljo Roos | <i>Position:</i> Principal Consultant, DNV GL, Indonesia | |
| <i>Approved by:</i> Mette Eriksen | <i>Position:</i> Head of Department Sustainability, DNV GL, Norway | |
| <i>Approved by:</i> Roni H. Zulkarnain | <i>Position:</i> Act. Head of SHEQ Department, PT Badak NGL, Indonesia | |

This report may be shared within with external parties for promotional purposes.

Table of Contents

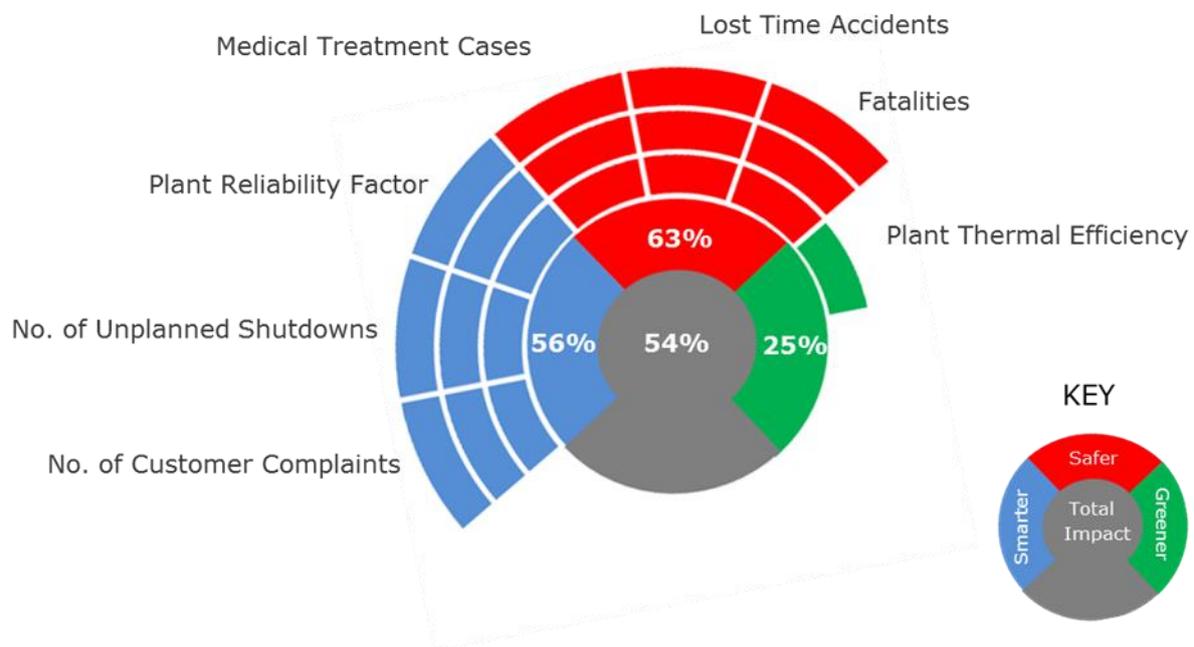
| | |
|---|-----------|
| 1 EXECUTIVE SUMMARY | 3 |
| 2 INTRODUCION | 4 |
| 2.1 Introduction to the“Safer Smarter Greener”Concept | 4 |
| 2.2 Introduction to PT Badak NGL | 5 |
| 2.3 Introduction to the Project to Improve Safety Management at PTB using the International Safety Rating System | 5 |
| 3 SAFER SMARTER GREENER MEASUREMENT METHODOLOGY | 5 |
| 4 DATA COLLECTION | 6 |
| 5 FINDINGS | 6 |
| 5.1 Stakeholders for the Project | 6 |
| 5.2 Stakeholder Expectations for the Project | 7 |
| 5.3 Aspects of the Project that Created Most Value | 7 |
| 5.4 What Changed as a Result of the Project? | 8 |
| 5.5 To what Extent is the Change Attributable to this Project? | 8 |
| 5.6 Did the Project Outcome Meet Your Expectation? | 8 |
| 5.7 Lessons Learned | 9 |
| 6 IMPACT MAP | 10 |
| 7 IMPACT PROFILE | 12 |
| 8 ANALYSIS | 13 |
| 9 CONCLUSIONS | 13 |

1 EXECUTIVE SUMMARY

This case study is available in an internal version and an external version. This internal version contains information on the assessment of “project enablers” and is intended for DNV GL use only.

PT Badak NGL (PTB) is the world’s fourth largest LNG plant with a total production capacity of 22.5 million tonnes of LNG per year. Located in East Kalimantan in Indonesia, PTB has been in operation for over 30 years and employs more than 4,000 people including contractors. In 2005, PTB experienced a fatality and another serious injury and determined to improve their safety performance. They decided to use DNV GL’s International Safety Rating System (ISRS) as their roadmap and measuring tool for management system development and improvement, to help them achieve their goal of a “world class safety culture” within a three year time frame. Since 2006, DNV GL has been assisting PTB in improving their safety management system. This work has involved assessment, training and advisory services based on ISRS.

DNV GL has the vision “global impact for a safe and sustainable future.” It is therefore important for DNV GL to consider what the impacts its services are having and to what extent they contribute to a safer and more sustainable future. This case study pilots the “Safer Smarter Greener Measurement Methodology” to assess the impact of the project to improve safety management at PTB using the International Safety Rating System between 2006 and 2012. The outcomes of the project are summarised in the “Impact Profile” below.



The Impact Profile describes which safer, smarter and greener performance measures have been impacted by the project and the extent to which they have been impacted. The total impact is calculated at 54% as defined by the Safer Smarter Greener Measurement Methodology.

Kuswana Yugaswara, the former SHEQ Management System Coordinator for PTB commented on the project; “Having a proper measurement tool like ISRS will not directly fix everything. But

without good tools we will not be able to create a good management system. First we have to have good tools, second we have to have a good management system, and third we have to have good leadership commitment from the top, because whenever the top leader has good commitment the lower levels will follow. Using ISRS has helped us to have a healthier company. Trying to follow the ISRS rules helps us to achieve the performance we expect.”

2 INTRODUCTION

The purpose of this case study is to describe the DNV GL project to improve Health, Safety, Environmental and Quality (HSEQ) management at PT Badak NGL in Indonesia over the period 2006 to 2012 through the implementation of DNV GL’s International Safety Rating System (ISRS). The case study will focus in particular on the impacts this project created for the customer. This case study is a pilot to test a new measurement methodology that DNV GL has developed to measure, improve and demonstrate the impacts of its projects and services.

2.1 Introduction to the “Safer Smarter Greener” Concept

DNV GL has the vision “global impact for a safe and sustainable future.” It is important then to ask what the impact of DNV GL service’s are and to what extent do they contribute to a safer and more sustainable future. DNV GL would like to measure the safety and sustainability impacts of its services in order to improve their impact because as Peter Drucker reminds us, “if you can’t measure it, you can’t manage it.”¹ DNV GL would also like to better demonstrate the impact of its services to its stakeholders. DNV GL categorises its service impacts under the headings “Safer, Smarter, Greener” which are used frame its assessment of impacts.

It is challenging to measure the impact of professional services. DNV GL provided a wide range of assessment, verification and advisory services to its clients. Client organisations are complex systems of people, assets and processes operating within a dynamic global marketplace. It is hard to determine how a particular project input to this complex system contributes to a particular performance outcome. The “Safer Smarter Greener Measurement Methodology” addresses this challenge. The design criteria for the methodology were as follows:

| Methodology Design Criteria | Explanation |
|-----------------------------|--|
| Effective | Issues assessed are valid and meaningful measures of Safer Smarter Greener impacts |
| Verifiable | Stakeholders consider the methodology is rigorous, repeatable and transparent |
| Efficient | Not too resource intensive |
| Practical | Users can quickly learn and implement the approach |
| Simple | As simple as possible (but no simpler) |
| Remarkable | Helpful in positioning DNVGL |

¹Drucker, P. F., 1954. The Practice of Management

2.2 Introduction to PT Badak NGL

PT Badak NGL (PTB) is the world's fourth largest LNG plant. PTB's headquarters are in Jakarta, Indonesia. It has one production facility in Bontang, East Kalimantan, Indonesia. PTB has been in operation for over 30 years and employs more than 4,000 people including contractors. PTB has eight LNG process trains and the total production capacity of the eight trains is 22.5 million tonnes of LNG per year.

2.3 Introduction to the Project to Improve Safety Management at PTB using the International Safety Rating System

From 2006 to date, DNV GL has been assisting PTB in improving their HSEQ management system. This project has involved assessment, training and advisory services based on DNV GL's International Safety Rating System (ISRS).

In 2005, PTB experienced a fatality and another serious injury and determined that they needed to change. They decided to use ISRS 7th edition as their roadmap and measuring tool for management system development and improvement, to help them achieve their goal of "world class safety culture" within a three year time frame.

PTB progressed to ISRS 8th edition in 2010 to improve their standards in process safety management. PTB were the first company to achieve ISRS8 Award Level 8 worldwide and remain the highest performing company in ISRS in the oil and gas industry today. They enjoy a reputation among LNG installations worldwide as the 'go-to guys' for LNG plant start-up, operations, maintenance, and personnel training and development.

Every year since 2006, PTB have been independently assessed against the ISRS standard by a team from DNV GL. The ISRS Awards resulting from these assessments are as follows:

2006 - ISRS7 Level 3
2007 - ISRS7 Level 5
2008 - ISRS7 Level 7
2009 - ISRS7 Level 8
2010 - ISRS8 Level 8
2011 - ISRS8 Level 8
2012 - ISRS8 Level 8
2013 - ISRS8 Level 8

3 SAFER SMARTER GREENER MEASUREMENT METHODOLOGY

A summary of the Safer Smarter Greener Measurement Methodology is shown below.

1. Develop Impact Map

- Interview DNV GL Project Manager
- Interview Client representatives
- Score impact map and record comments and quotes.

3. Develop Impact Profile

- Use scores from impact map and project enablers to create impact profile.

4. Develop Case Study

- Combine impact map and impact profile with comments and quotes to create a case study.

The questions asked to both client and DNV GL personnel during the interviews are:

- Who were the stakeholders for this project?
- What did the different stakeholders expect the outcome of the project would be?
- Which aspects of the project have created most value to your organisation? Why?
- What actually changed in the organisation as a result of the project?
- How do you measure that change? What indicators/metrics do you use?
- What has been the change in these indicators/metrics?
- What percentage of the change is attributable to this project?
- To what extent did the outcome meet your expectation?
- What have been the lessons learned from this project?

The client organisation is also required to share relevant data on their outcome performance. This data is typically in the form of Key Performance Indicator information over a period of years. This may be done in accordance with a Non-Disclosure Agreement describing how DNV GL will use the information provided.

The section below describes how this methodology was applied to the project at PTB.

4 DATA COLLECTION

Interviews were conducted with Kuswana Yugaswara, the former SHEQ Management Coordinator at PTB and Prihtyasiwi Ramdhani, SHEQ Management Systems Specialist at PTB. An interview was conducted with Eric Kaljo Roos, a Principal Consultant for DNV GL, who has been the DNV GL Project Manager since the project began. The interviews were typically 1 hour in length. Each interview was recorded and transcribed.

PTB also shared summary information on their company's Key Performance Indicators for the period 2006 to 2012.

5 FINDINGS

5.1 Stakeholders for the Project

The "key stakeholders" for this project were:

- President Director & CEO
- Director & Chief Operating Officer
- SHEQ Senior Manager
- PTB management team
- Employees

For the purposes of this case study, only key stakeholders are considered. However, the stakeholders below were also identified as being affected by the project:

- PTB President Director & CEO in Jakarta
- PTB Board of Commissioners
- Family Members
- Labour Unions
- Customers
- Shareholders
- Gas Producers
- LNG Transporters
- Central and Local Government – PTB is part owned by Pertamina, the national oil company of Indonesia
- Contractors and Suppliers

5.2 Stakeholder Expectations for the Project

“The expectations for implementing ISRS were firstly to stop the fatalities and lost time accidents. Second was to reduce the severity rate and number of minor accidents. Most people here also wanted an integrated system where safety was part of the line management’s responsibility. Another expectation was to increase SHEQ awareness and improve SHEQ culture. We wanted to have a team culture where safety was everyone’s responsibility. People should not only think about safety of themselves but also about others while they were working.”(Kuswana Yugaswara, former SHEQ Management System Coordinator)

“The expectations of the PTB management team were to have fewer accidents and reduce costs through increased plant reliability. The employees want to have fewer accidents and a healthier workplace.” (Prihtyasiwi Ramdhani, SHEQ Management Systems Specialist)

5.3 Aspects of the Project that Created Most Value

“Having a proper measurement tool like ISRS actually will not directly fix everything. But without good tools we will not be able to create a good management system. First we have to have good tools, second we have to have a good management system, and third we have to have good leadership commitment from the top level, because whenever the top level has good commitment the lower levels will follow the expectations of their leaders. By having this good management system, the company will run the organisation according to a proper guidelines or procedures. Using ISRS helps us to have a healthier company. By trying to follow step by step the ISRS requirements, it helps us to achieve the performance we expect.” (Kuswana Yugaswara, former SHEQ Management System Coordinator)

“The most important change is the increased commitment of management and the employees to improve ourselves. The ISRS leadership process has many good practice examples. This helps our management know what to do, then they do it and their commitment improves. The employees see what the management do and try to follow them.” (Prihtyasiwi Ramdhani, SHEQ Management Systems Specialist)

“The involvement and commitment of the DNV GL staff has helped build the management’s commitment for the programme.” (Prihtyasiwi Ramdhani, SHEQ Management Systems Specialist)

5.4 What Changed as a Result of the Project?

“Firstly the SHEQ performance indicators over time have been getting better. The second improvement is the management involvement and development of the SHEQ management system. The development of the SHEQ management system was based on the ISRS requirements, to achieve the desired SHEQ performance and requires managers to do certain mandatory actions. ISRS has therefore driven certain management actions. For example, leadership commitment we have implemented a weekly management walk through, that we call “STAR Plus” (Safety Tour and Review plus an appreciation) where managers conduct a weekly safety tour as per a defined schedule and focus to meet with the people, discuss what the company wants and does not want and then give the appreciation. I think one of the biggest impact from this project has been achieved by this STAR Plus management walkthrough program. From this management s activity, everybody feels that safety has become everybody’s business. Safety cannot be delegated to safety inspectors. Another change is that people now think about the important of understanding risk families. “Hazard Evaluation and Risk Assessments” must be completed before a work permit is issued. Every day before any job is started, the group of workers have a Toolbox Meeting to discuss and evaluate the risks and how to controls them. We conduct regular Physical Condition Tours (PCT) and Physical Barrier Assessments (PBA) involving relevant people from the operations, maintenance, technical and SHEQ departments. Using small teams or task forces, consisting of personnel with various disciplines from different departments, encourages people working in cooperative team and developing networking contributions. Involving people in these teams, increases their motivation and awareness that they are also responsible for safety.”(Kuswana Yugaswara, former SHEQ Management System Coordinator)

“The site leadership is behaving more consistently now. The management system is in place. Leaders come, leaders go, but when a leader comes in they follow the system, rather than the system changing to become the new leader’s way.” (Eric Roos, Principal Consultant, DNV GL)

5.5 To what Extent is the Change Attributable to this Project?

“I would say these changes are 75% due to the ISRS project and that is the lowest estimate. People sometimes complain about the management system work they must do but unless the people are forced by the system, the ISRS measurement tool and the practicality of the ISRS assessment, maybe we would not achieve this desired performance. We do all our activities in accordance with the relevant procedures that had been based on or refer to the ISRS Book of Knowledge.” (Kuswana Yugaswara, former SHEQ Management System Coordinator)

5.6 Did the Project Outcome Meet Your Expectation?

“If we are looking from the achievement of the KPIs of course the project has met our expectations. For example on plant availability we operated at 94% in 2012 so everyone was happy. But the change means more than that. Our plant is safer, and more reliable. What we have here now a team culture in which people look after each other, and never do a job if the condition

is unsafe. Everybody is willing to talk to each other to work safely including contractors, and they will stop somebody if they feel he is doing something unsafe. It is not necessary to think it theoretically. They just stop it immediately and then discuss what better thing can be done to resolve the situation.”(Kuswana Yugaswara, former SHEQ Management System Coordinator)

5.7 Lessons Learned

“We have never come to the place where we can stop working hard to improve safety because the organisation is always changing. People move around from one position to another position and there are always new employees starting. Some people retire and maybe they do not transfer their knowledge and experience to the new generation. We have to be careful because even if we achieve almost everything that we expect, the conditions are always changes so we have to improve, improve, and improve all the time.” (Kuswana Yugaswara, former SHEQ Management System Coordinator)

“We have improved our SHEQ management system. We know we are better but we also know we need to maintain and keep this good work which is a hard thing to do. I think a hard thing for the future is that we have regular reorganisations. Our organisation structure moves so fast it makes it hard to maintain the performance because there is always someone new in every department. People are often only in position for a short time before moving to another department.” (Prihtyasiwi Ramdhani, SHEQ Management Systems Specialist)

“If PTB stopped doing ISRS today, the strong safety performance might last for a while because of the systems own inertia, but if they don’t keep injecting it with creativity, time and investment it can’t last forever. The challenge is to keep the programme spicy and interesting.” (Eric Roos, Principal Consultant, DNV GL)

6 IMPACT MAP

The Impact Map below has been developed by combining the comments from the interview and the PTB KPI data.

| Category | | | | Results | | | | | | | Analysis | | | | | | | | | |
|------------------|-----------------------|----------------------------|---|---------|------|-------|-------|-------|-------|---|---|--|---|---|--|--|-------|--------------|------------------|------------------|
| Performance Type | Performance Issue | Indicator or proxy | Information Source | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | Trend | Trend Analysis | 1. What percentage the change is attributable to this project? | 2. Did the change meet client expectations? | 3. Do results demonstrate sustained good performance? | 4. Do results demonstrate continual improvement? | 5. Do results compare favourably with world class? | Score | Impact Score | Group Impact (%) | Total Impact (%) |
| Safer | Health and Safety | Medical Treatment Cases | Company KPI/ Sustainability Reports 2011 & 2012 | 7 | 8 | 4 | 4 | 2 | 1 | | Trend indicates minor injuries to company's 1200 employees reducing close to zero | 75% | yes | yes | yes | Yes. Refer to benchmarking study | 4 | 3.0 | 63 | |
| | Health and Safety | Lost Time Accidents | Company KPI/ Sustainability Reports 2011 & 2012 | 0 | 0 | 0 | 0 | 0 | 0 | ZERO Lost Time Accidents since 2006 | No serious injuries to employees for 6 years | 75% | yes | yes | | Yes. Refer to benchmarking study | 3 | 2.3 | | |
| | Health and Safety | Fatalities | Company KPI/ Sustainability Reports 2011 & 2012 | 0 | 0 | 0 | 0 | 0 | 0 | ZERO Fatalities since 2006 | No fatalities to employees for 6 years | 75% | yes | yes | | Yes. Refer to benchmarking study | 3 | 2.3 | | |
| Smarter | Plant Reliability | Plant Reliability Factor | Company KPI/ Sustainability Reports 2011 & 2012 | | | 99.70 | 97.67 | 99.16 | 99.2 | | Focus on improving reliability since 2010 has resulted in improved performance | 75% | yes | yes | | Yes. Refer to benchmarking study | 3 | 2.3 | 56 | 54 |
| | Plant Reliability | No. of unplanned shutdowns | Company KPI | | | 12 | 18 | 9 | 4 | | Focus on improving reliability since 2010 has resulted in improved performance | 75% | yes | yes | yes | | 3 | 2.3 | | |
| | Customer Satisfaction | No. of complaints | Company KPI | 9 | 4 | 0 | 7 | 0 | 0 | | Customer complaints have fallen during the period. There have been no complaints for 2 years. | 75% | yes | yes | yes | | 3 | 2.3 | | |
| Greener | Energy Efficiency | Plant Thermal Efficiency | Company KPI | | | 88.53 | 88.47 | 88.54 | 88.47 | | Plant Thermal Efficiency level has been maintained | 50% | yes | yes | | | 2 | 1.0 | 25 | |
| | | | | | | | | | | | | | | | | | 0.0 | | | |
| | | | | | | | | | | | | | | | | | | 0.0 | | |

Explanation of Impact Map

Based on the interview comments and client KPI information, indicators have been selected to be included within the “safer, smarter and greener” categories. For each of these indicators, trend information has been provided for the period the project has been running. A trend analysis has been made for each indicator and this trend has been rated according to the 5 questions below. These questions are designed to test the extent of the change in performance and the extent to which the change is attributable to the project. These questions have been designed to meet the “effective” and “verifiable” success criteria described in Section 2.1. Attribution is a difficult characteristic to determine accurately. This methodology relies on the client’s estimate.

1. What percentage of the change is attributable to this project? (1 to 100)
2. Did the change meet the client expectations? (Yes = 1 / No = 0)
3. Do results demonstrate sustained good performance? (Yes = 1 / No = 0)
4. Do results demonstrate continual improvement?(Yes = 1 / No = 0)
5. Do results compare favourably with world class? (Yes = 1 / No = 0)

To answer question 5 positively the organisation must have performed a benchmarking study. In this project, benchmarking studies were available for the following issues:

- Medical Treatment Cases, Lost Time Accidents and Fatalities (Oil and Gas Producers Association Accident Study 2012)
- Plant Reliability Factor (Philip Townsend Associates LNG Benchmarking Study)
- Environmental and Social Responsibility– “PROPER Gold Award” from the Indonesian Ministry of Environmental Affairs for the second time in 2012, based on an evaluation of their Environmental Management System, Energy Conservation, Water Conservation, Waste Reduce, Reuse & Recycling, GHG Reduction, Biodiversity and Community Development.

The impact score for a particular indicator is a function of the scores for the five questions above. For example: The impact score for Medical Treatment Cases is calculated as follow:

Where

A = Attribution %

B = Client Expectations Score

C = Sustained Good Performance Score

D = Continual Improvement Score

E = World Class Score

$$\begin{aligned}\text{Medical Treatment Case Impact Score} &= A \times (B+C+D+E) \\ &= 75\% \times (1+1+1+1) \\ &= 3.0\end{aligned}$$

The group impact percentages are a function of the impacts scores for the indicators in their group. For example the Safer Impact % is calculated as follows:

Where

F = Medical Treatment Cases Impact Score

G = Lost Time Accidents Impact Score

H = Fatalities Impact Score

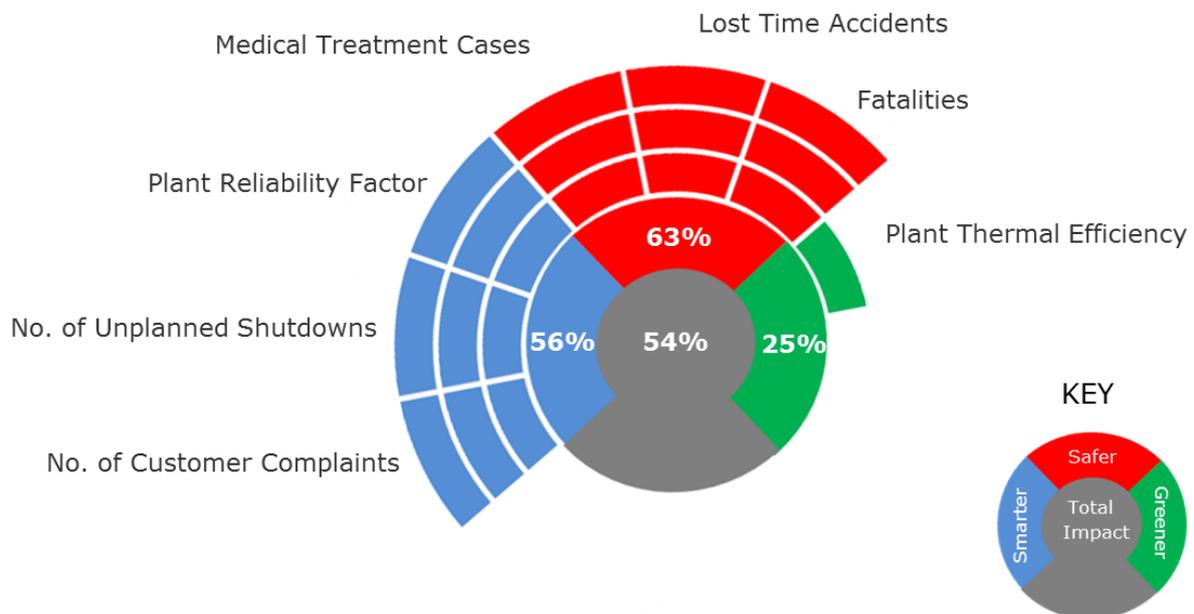
$$\begin{aligned} \text{Safer Impact Score} &= ((F+G+E)*100)/\text{maximum possible score} \\ &= (3.0+2.3+2.3)*100/12 \\ &= 63\% \end{aligned}$$

The Total Impact score is calculated in a similar way but including all the indicators.

The impact scores for each indicator as well as the Safer Impact, Smarter Impact, Greener Impact and Total Impact are shown on the Impact Profile below.

7 IMPACT PROFILE

The overall impact of the project is shown in the Impact Profile below. The red, blue and green sections refer to the respective safer, smarter and greener impacts. The grey section shows the performance for sustainable project management. By measuring both results and enablers in this way, it is hoped that a more holistic perspective on the sustainability performance is presented.



The number of blocks shown for each indicator is a representation of its percentage score as follows: 1 block (0%-25%), 2 blocks (25%-50%), 3 blocks (50%-75%), 4 blocks (75%- 100%).

8 ANALYSIS

The biggest impact of this project has been in term of the safety performance improvement. All safety measures show world leading performance and medical treatment cases shows a continually improving performance. For a major hazard site with 4000 employees to have achieved zero fatalities and zero lost time accidents since 2006 is an excellent achievement. PTB can demonstrate they have achieved their goal to establish a world class safety culture.

In terms of “smarter impacts”, the plant reliability indicator demonstrates sustained good performance at a world class level and the number of unplanned stoppages demonstrates continual improvement. The continuously falling level of customer complaints indicates rising levels in quality performance.

Finally the plant’s thermal efficiency demonstrates sustained good performance in a key measure of environmental performance.

9 CONCLUSIONS

This case study presents a qualitative and quantitative analysis of the impacts created by the ISRS implementation project at PTB between 2006 and 2012.

The quantitative analysis shows that the project has had significant impact across a range of safer, smarter and greener indicators. Using ISRS, PTB has been able to achieve world class performance in safety and plant reliability.

The qualitative analysis obtained through interviews with PTB and DNV GL personnel supports the quantitative analysis and attributes 75% of the performance improvements to the implementation of ISRS.

DNV GL:

DNV GL is a leading, independent provider of services for managing risk with a global presence and a network of more than 300 offices in 100 different countries. DNV GL's objective is to safeguard life, property and the environment. DNV GL's vision is global impact for a safe and sustainable future.