Luglio 2015

ALLEGATO 3:
SPECIFICHE TECNICHE DEI MEZZI UTILIZZATI

Integrazioni allo Studio di Impatto Ambientale

Istanze di Permesso di Ricerca “d 89 F.R-.GM”, “d 90 F.R-.GM”

Proponente:

Global MED LLC

Sommario

Indice delle figure

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Luglio 2015

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1 DETTAGLI TECNICI DEI MEZZI IMPIEGATI PER L'ESECUZIONE DELL'INDAGINE

Nel presente capitolo verranno illustrati i mezzi che si intende utilizzare per l'indagine sismica dell'area in oggetto, con indicazione dei parametri tecnici che la caratterizzeranno.

Global MED ha siglato un accordo con la compagnia Polarcus, che intende effettuare le operazioni di acquisizione attraverso una delle sue navi ultra moderne della classe "N", una nave con motori a propulsione diesel-elettrica tra le più ecocompatibili disponibili sul mercato.

Polarcus opera con una flotta ultra-moderna che incorpora le caratteristiche marittime e ambientali più avanzate, tra cui un innovativo design dello scafo (*inverted bow hull*) in grado di operare in condizioni più impegnative riducendo al minimo le interferenze acustiche della nave in fase di acquisizione. Offre una gamma completa di servizi, dalla classica sismica 3D/4D al wide and multi-azimuth. La speciale configurazione permette di operare anche in ambiente artico.

La nuova flotta è pensata per ottimizzare e soddisfare le esigenze attuali e future nel settore della prospezione geofisica. La politica di Polarcus si basa su un alto livello di innovazione e leadership tecnologica, per fornire immagini strutturali del sottosuolo di alta qualità.

1.1 Mezzi impiegati

Tra i mezzi che verranno impiegati, Polarcus con Global MED ha intenzione di effettuare le operazioni di acquisizione attraverso la nave ultra moderna Polarcus Nadia o la nave Polarcus Naila, a seconda della futura disponibilità (Figura 1.1).

Entrambe le navi fanno parte della classe "N", costituite da 12 *streamer* 3D/4D progettate ULSTEIN e costruite dalla Drydocks World Dubai LLC, designata con l'appellativo ULSTEIN SX124. Lo scafo è del tipo ULSTEIN X-BOW® ed è il risultato delle ultime novità sul campo della ricerca, in grado di combinare i sistemi per l'esplorazione geofisica con le più moderne tecnologie. Questo tipo di nave è mossa da motori a propulsione diesel-elettrica rendendola tra le più ecocompatibili navi per l'esplorazione geofisica disponibili sul mercato. È dotata di convertitori catalitici, doppio scafo, e di un avanzato sistema di pulizia dell'acqua di sentina.

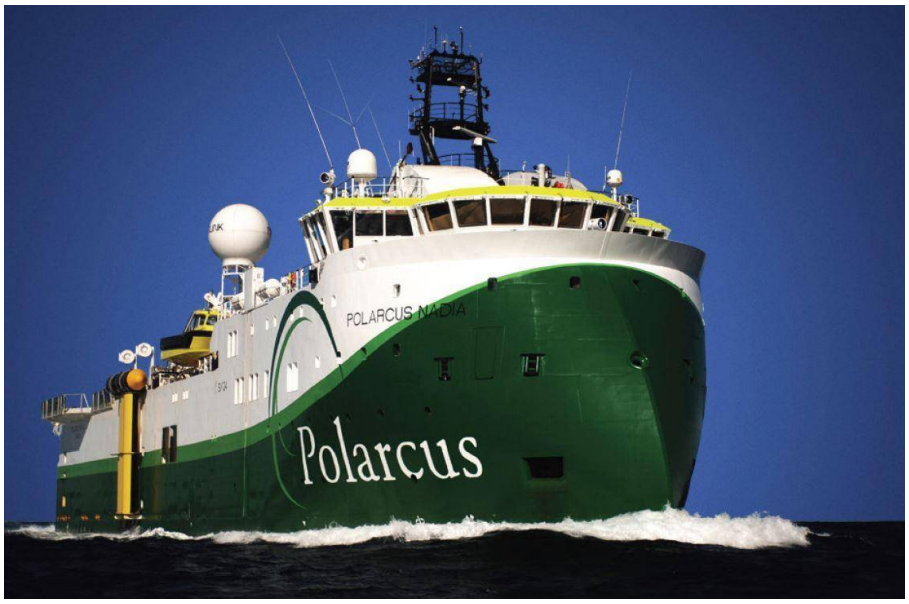


Figura 1.1 – Fotografia di una nave della classe "N" in particolare la nave Polarcus Nadia, che si prevede di utilizzare durante l'esecuzione del rilievo sismico (fonte: Polarcus)

Questo tipo di imbarcazione è conforme con le più stringenti normative in ambito di sicurezza ambientale, *DNV Clean design*. In Tabella 1.1 vengono fornite alcune delle informazioni principali relative alla nave per l'acquisizione geofisica.

Dati generali	
Stazza lorda (t)	6570
Stazza netta (t)	2077
Lunghezza (m)	88,8
Larghezza (m)	19,0
Pescaggio massimo (m)	6,6
Elicottero	Sikorsky S-61N/S-92
Capacità e consumi	
Capacità dei serbatoi d'acqua potabile	768 m^3 totali; 208 m^3 potabili
Capacità massima dei serbatoi di carburante	1540 m^3
Tipo di alimentazione	Gasolio marino (MGO)
Velocità massima in acque calme	15 nodi
Durata della riserva di carburante (durante l'acquisizione)	43 giorni
Equipaggiamento di sicurezza certificato	60 persone
Sistemi di navigazione e posizionamento	
Sistemi radar	S-band ARPA – X-band ARPA
Sistemi di navigazione	ECDIS chart system, DGPS
Sistemi di comunicazione	
Primaria	GMDSS A4
Secondaria	Inmarsat F Fleet-77
Comunicazioni	VSAT

Tabella 1.1 – Specifiche tecniche della nave che verrà utilizzata per l'acquisizione sismica in progetto (fonte: Polarcus).

Unitamente alla nave di acquisizione verranno utilizzate una nave da supporto e una da inseguimento, con lo scopo di comunicare con le imbarcazioni che operano nella zona, onde evitare l'interferenza con la nave sismica e da supporto logistico. La nave di supporto fornisce anche assistenza aggiuntiva alla nave sismica.

1.2 Parametri di acquisizione

Il progetto di acquisizione che Polarcus ha intenzione di eseguire è studiato in modo da utilizzare la fonte di energizzazione più adeguata per minimizzare il potenziale disturbo acustico per l'ambiente circostante e ottenere una buona risoluzione del segnale.

Nello specifico del progetto, Polarcus ha scelto l'utilizzo di *air-gun* tipo Bolt LLX-LLXT, 2 *source array* per un volume totale di 3480 in^3 e 2380 in^3. Entrambi gli array sono composti da 3 *sub-array* con 12 *air-gun* ciascuno andando a coprire un'area di 14x14 metri quadrati.

La scelta della sorgente sismica per questo progetto è studiata per garantire il raggiungimento degli obiettivi attenuando potenziali disturbi alla fauna marina nelle immediate vicinanze della zona di indagine.

I parametri previsti per l'acquisizione in progetto sono indicati in Tabella 1.2, la quale riporta le varie specifiche tecniche del cavo *streamer*, della sorgente di energia e delle tecniche di registrazione.

Sistemi di acquisizione in dotazione	
Tipo di cavo *streamer*	Sercel Sentinel solid streamers
Sorgente sismica	Bolt 1500-LL/1900-LLXT dual sources
Tipo di acquisizione	Sercel Seal Marine Data Acquisition system
Sistema di navigazione	*ION Orca*
Sistema posizionamento streamer	ION DigiBIRD depth controllers, DigiRANGE acoustics
Sistema controllo sorgente	Seamap GunLink 4000 fully distributed digital gun controller
Parametri della sorgente	
Tipo di sorgente	*Air-gun*
Volume alla sorgente di Array (In3)	3480
Numero di subarray	3
Numero di *air-guns* per *subarray*	12
Lunghezza subarray (m)	14
Profondità dei 3 subarray sorgente (m)	7
Pressione operativa (psi)	2000

Tabella 1.2 – Parametri previsti per l'acquisizione delle linee sismiche (fonte: Polarcus).

La configurazione dell'*array* che verrà adottata è stata progettata attraverso il modello matematico GUNDALF (www.gundalf.com), largamente utilizzato negli studi di questo settore. Questa configurazione standard è del tutto similare a quella che verrà utilizzata durante il rilievo di acquisizione.

Le caratteristiche dell'*array* sono elencate in Tabella 1.3. Il valore RMS (scarto quadratico medio) è calcolato sull'intero modello identificativo. Vengono visualizzati anche i limiti conservativi di errore per le principali caratteristiche identificative del picco-picco (*peak to peak*). Questi rappresentano gli intervalli di confidenza al 95% del modello GUNDALF rispetto i suoi dati di calibrazione.

Array parameter : (0-25000) Hz	Array value
Number of guns	33
Total volume (cu.in).	3480.0 (57 litres)
Peak to peak in bar-m.	399 +/- 3.54 (39.9 +/- 0.354 MPa, ~ 272 db re 1 muPa. at 1m.)
Zero to peak in bar-m.	195 (19.5 MPa, 266 db re 1 muPa. at 1m.)
RMS pressure in bar-m.	12.3 (1.23 MPa, 242 db re 1 muPa. at 1m.)
Primary to bubble (peak to peak)	85.4 +/- 19.8
Bubble period to first peak (s.)	0.0983 +/- 0.0246
Maximum spectral ripple (dB): 10.0 -70 Hz.	7.82
Maximum spectral value (dB): 10.0 – 70	216
Average spectral value (dB): 10.0 – 70 Hz.	213
Total acoustic energy (Joules)	427596.2
Total acoustic efficiency (%)	54.3

Tabella 1.3 – Caratteristiche dell'array utilizzato per la modellazione (fonte: Polarcus)

La Figura 1.2 mostra la configurazione dell'*array* proposto per l'indagine sismica in progetto, mediante una rappresentazione grafica in pianta. I rettangoli verdi rappresentano gli *air-gun*, mentre i cerchi rossi indicano il raggio massimo raggiunto dalle bolle di aria compressa. Le interazioni del campo di pressione si estendono normalmente per una distanza 10 volte maggiore del raggio della bolla.

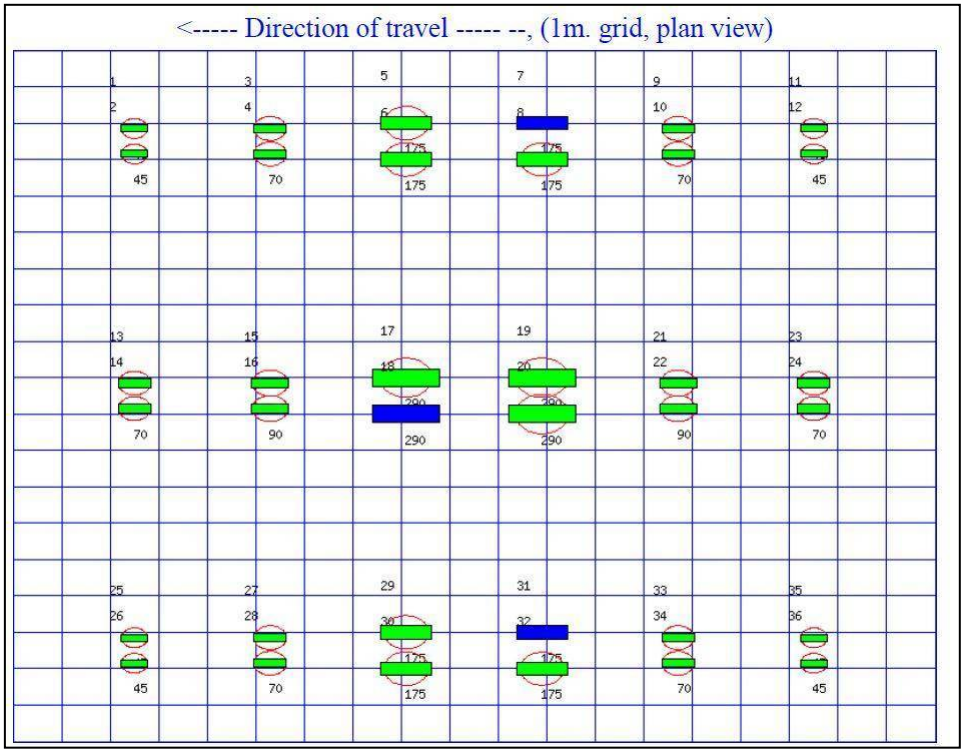


Figura 1.2 – Rappresentazione grafica della configurazione dell'array (in pianta) proposto per l'indagine sismica in progetto. I rettangoli verdi rappresentano gli air-gun, mentre i cerchi rossi indicano il raggio massimo raggiunto dalle bolle di aria compressa (fonte: Polarcus).

La Tabella 1.4 elenca le caratteristiche degli *air-gun* che verranno utilizzati, con indicazione in percentuale del contributo approssimativo del picco di ampiezza del singolo *air-gun* rispetto a quello dell'intero *array* (*p-p contrib*).

Air gun	Pressione (psi)	Volume (cubic inches)	Tipo	X (m)	Y (m)	Z (m)	Ritardo (s)	sub-array	p-p contrib (%)
1	2000.0	45.0	1900LLXT	0.000	-14.350	7000	0.00000	1	3.4
2	2000.0	45.0	1900LLXT	0.000	-13.650	7000	0.00000	1	3.4
3	2000.0	70.0	1900LLXT	2.800	-14.350	7000	0.00000	1	3.4
4	2000.0	70.0	1900LLXT	2.800	-13.650	7000	0.00000	1	3.4
5	2000.0	175.0	1500LL	5.600	-14.500	7000	0.00000	1	2.2
6	2000.0	175.0	1500LL	5.600	-13.500	7000	0.00000	1	2.2
7	2000.0	175.0	1500LL	8.400	-14.500	7000	0.00000	1	SPARE
8	2000.0	175.0	1500LL	8.400	-13.500	7000	0.00000	1	2.2
9	2000.0	70.0	1900LLXT	11.200	-14.350	7000	0.00000	1	3.4
10	2000.0	70.0	1900LLXT	11.200	-13.650	7000	0.00000	1	3.4

11	2000.0	45.0	1900LLXT	14.000	-14.350	7000	0.00000	1	3.4
12	2000.0	45.0	1900LLXT	14.000	-13.650	7000	0.00000	1	3.4
13	2000.0	70.0	1900LLXT	0.000	-7.350	7000	0.00000	2	3.4
14	2000.0	70.0	1900LLXT	0.000	-6.650	7000	0.00000	2	3.4
15	2000.0	90.0	1900LLXT	2.800	-7.350	7000	0.00000	2	3.3
16	2000.0	90.0	1900LLXT	2.800	-6.650	7000	0.00000	2	3.3
17	2000.0	290.0	1500LL	5.600	-7.500	7000	0.00000	2	1.9
18	2000.0	290.0	1500LL	5.600	-6.500	7000	0.00000	2	SPARE
19	2000.0	290.0	1500LL	8.400	-7.500	7000	0.00000	2	1.8
20	2000.0	290.0	1500LL	8.400	-6.500	7000	0.00000	2	1.8
21	2000.0	90.0	1900LLXT	11.200	-7.350	7000	0.00000	2	3.3
22	2000.0	90.0	1900LLXT	11.200	-6.650	7000	0.00000	2	3.3
23	2000.0	70.0	1900LLXT	14.000	-7.350	7000	0.00000	2	3.4
24	2000.0	70.0	1900LLXT	14.000	-6.650	7000	0.00000	2	3.4
25	2000.0	45.0	1900LLXT	0.000	-0.350	7000	0.00000	3	3.4
26	2000.0	45.0	1900LLXT	0.000	0.350	7000	0.00000	3	3.4
27	2000.0	70.0	1900LLXT	2.800	-0.350	7000	0.00000	3	3.4
28	2000.0	70.0	1900LLXT	2.800	0.350	7000	0.00000	3	3.4
29	2000.0	175.0	1500LL	5.600	-0.500	7000	0.00000	3	2.2
30	2000.0	175.0	1500LL	5.600	0.500	7000	0.00000	3	2.2
31	2000.0	175.0	1500LL	8.400	-0.500	7000	0.00000	3	SPARE
32	2000.0	175.0	1500LL	8.400	0.500	7000	0.00000	3	2.2
33	2000.0	70.0	1900LLXT	11.200	-0.350	7000	0.00000	3	3.4
34	2000.0	70.0	1900LLXT	11.200	0.350	7000	0.00000	3	3.4
35	2000.0	45.0	1900LLXT	14.000	-0.350	7000	0.00000	3	3.4
36	2000.0	45.0	1900LLXT	14.000	0.350	7000	0.00000	3	3.4

Tabella 1.4 – Caratteristiche degli air-gun che verranno utilizzati, con indicazione in percentuale del contributo approssimativo del picco di ampiezza del singolo air-gun rispetto a quello dell'intero array (elaborazione del modello matematico Gundalf) (fonte: Polarcus).

1.3 Utilizzo di risorse

Le attività di acquisizione verranno supportate dall'utilizzo di Gasolio marino (MGO) per il funzionamento della nave sismica e delle navi di supporto. Oltre al funzionamento dei motori il carburante servirà anche per il motogeneratore del compressore previsto per la produzione di aria compressa per gli *air-gun*.

Sulla base di esperienze analoghe si possono ipotizzare i seguenti consumi specifici di carburante.

Nelle seguenti tabelle, si riportano i consumi previsti per le campagne di acquisizione 2D (Tabella 1.5) e per l'eventuale acquisizione 3D (Tabella 1.6) in progetto.

Complessivamente, l'indagine geofisica nelle due aree oggetto di istanza da parte di Global MED prevede l'acquisizione di un totale di 9 linee sismiche 2D a riflessione per una lunghezza complessiva di 300 chilometri, per cui si stima una durata totale dei lavori di circa 3 giorni, comprensivi di circa 0,8 giorni stimati di fermo per condizioni meteo-marine avverse. Una stima dei consumi di carburante è fornita in Tabella 1.5.

Come da programma lavori, in base agli esiti del rilievo geofisico 2D si valuterà l'eventualità di effettuare un'ulteriore acquisizione di tipo 3D. Al momento risulta difficile stimare con esattezza la durata totale del rilievo 3D, la quale dipende strettamente dalla stagione in cui verrà effettuata, dalle condizioni meteo riscontrate e dall'estensione areale oggetto del rilievo. In via cautelativa, per il caso di una successiva acquisizione 3D è stata fatta una stima temporale pari all'acquisizione sull'intera superficie dei permessi di ricerca. La durata complessiva dell'attività in questo caso risulterebbe di circa 63 giorni, comprensivi di una stima di circa 20 giorni di fermo tecnico.

Tale tempistica è stata stimata considerando l'intera area a disposizione, pertanto il tempo indicato e la relativa stima dei consumi di carburante (Tabella 1.6) sono da considerarsi puramente indicativi, corrispondenti all'ipotesi peggiorativa e del tutto irreale di un'acquisizione sull'intera estensione dei due blocchi. L'eventuale acquisizione 3D sarà concentrata, invece, solo in aree specifiche dei permessi di ricerca, andando di fatto a ridurre notevolmente la durata delle attività.

Tipo di nave	Numero	Durata acquisizione	Consumo medio di carburante al giorno	Totale consumi (m^3)
Nave sismica	1	3 giorni	32,9 (m^3/giorno)	98,7
Nave da supporto	1	3 giorni	6,0 (m^3/giorno)	18
Nave da inseguimento	1	3 giorni	1,72 (m^3/giorno)	5,16

Tabella 1.5 – Stima sul consumo di carburante dei vari mezzi impiegati durante l'acquisizione 2D

Tipo di nave	Numero	Durata acquisizione	Consumo medio di carburante al giorno	Totale consumi (m^3)
Nave sismica 3D	1	63 giorni	32,9 (m^3/giorno)	2072,7
Nave da supporto	1	63 giorni	6,0 (m3/giorno)	378
Nave da inseguimento	1	63 giorni	3,0 (m3/giorno)	189

Tabella 1.6 – Stima sul consumo di carburante dei vari mezzi impiegati durante l'acquisizione 3D

Il gasolio pesante (HFO) che spesso viene utilizzato in marina, è costituito principalmente da residui di raffineria. Oltre ai processi di distillazione, la qualità del gasolio è legata alla qualità del greggio. Ad esempio un greggio ad alta contenuto di zolfo comporterà un (HFO) alto zolfo e il combustibile conterrà alti livelli di aromatici policiclici cancerogeni (PCA*).

Come stabilito dall'ONU, tutti i combustibili pesanti (HFO) sono classificati come cancerogeni, dannosi e pericolosi per la vita e per l'ambiente.

Polarcus ha scelto di non utilizzare questo tipo di combustibile per la sua flotta in modo da promuovere la fornitura di servizi eco-compatibili, in linea con la propria politica di sensibilità ambientale.

I combustibili disponibili a bordo puliti sono l'olio diesel marino (MDO) e il gasolio marino (MGO). Questi sono distillati provenienti dal processo di raffinazione con viscosità molto bassa, basso tenore di zolfo (MDO ha di solito <1% di zolfo, MGO <0,2% di zolfo) e PCA inferiore.

Polarcus utilizza combustibile a basso tenore di zolfo per tutta la sua flotta.

1.4 Stima delle emissioni, rifiuti e scarichi

Le sensibilità ambientale di Polarcus accoglie con favore e sostiene la sfida fissata dall'Organizzazione marittima internazionale (IMO) e la Convenzione internazionale per la prevenzione dell'inquinamento causato da navi (MARPOL) al fine di ridurre al minimo le emissioni atmosferiche delle navi. Polarcus è anche impegnata a rispettare le misure di efficienza energetica tecniche ed operative IMO sviluppate per ridurre la quantità di emissioni di CO_2 da trasporto marittimo internazionale.

La flotta Polarcus oggi supera tutti i requisiti locali o internazionali in materia di riduzione delle emissioni.

Tutti i mezzi impiegati saranno conformi a quanto previsto dalla MARPOL (Convenzione internazionale per la prevenzione dell'inquinamento causato da navi) e le relative regole di protezione marina.

La regolamentazione per quanto riguarda il trattamento delle acque nere e di sentina vieta lo scarico diretto in mare. Lo scarico sarà effettuato solo tramite un adeguato trattamento conforme alla normativa vigente, attraverso processi di disinfezione eseguiti a bordo della nave. L'acqua di sentina sarà scaricata solo se la concentrazione dell'olio risulterà inferiore a 15 ppm dopo il trattamento.

l rifiuti alimentari saranno macerati prima di qualsiasi scarico. Generalmente, rifiuti di questo tipo sono da considerarsi di basso impatto ambientale.

Tra le tipologie di rifiuti solidi rientrano:

- rifiuti di carta, imballaggio, plastica e metallo ecc;
- rifiuti alimentari non adatti per lo scarico;
- rifiuti pericolosi e di rifiuti speciali (oli, batterie, vernici, ecc).

I rifiuti solidi non adatti allo scarico in mare saranno ordinati e conservati a bordo della nave a seconda della tipologia, prima di essere smaltiti a terra in appropriati impianti certificati.

Il piano di gestione dei rifiuti prevede l'uso di un registro sul quale verranno registrati i tipi e i volumi di rifiuti generati e le corrette tipologie di trattamento da eseguire ed eseguite per lo smaltimento.

1.4.1 Emissioni in atmosfera

Le emissioni in atmosfera che potrebbero avere effetti sulla qualità dell'aria, generate nel corso delle attività di acquisizione, sono legate essenzialmente allo scarico di gas dei motori e dei generatori utilizzati dalla nave sismica e dalle navi di supporto e da inseguimento. I principali gas inquinanti sono: biossido di carbonio, monossido di carbonio, ossidi di azoto, ossido di diazoto, metano e altri composti organici volatili.

La quantità di emissioni in atmosfera dipende dal carburante consumato durante l'indagine geofisica.

Un'altra fonte di emissioni in atmosfera potrebbe essere rappresentata dalle emissioni dell'inceneritore di rifiuti presente a bordo della nave di acquisizione. L'uso dell'inceneritore sarà limitato e discontinuo ed unicamente destinato allo smaltimento di rifiuti oleosi (oli e lubrificanti) e rifiuti solidi e non inciderà in modo significativo sulla qualità dell'aria dell'area oggetto di indagine.

Il combustibile utilizzato dalle navi (Gasolio Marino MGO/MDO) avrà un tenore di zolfo inferiore allo 0.2% in peso e gli inquinanti più significativi che in genere sono emessi sono rappresentati da NOx, SO_2, CO_2 e PM.

Le variabili che vengono considerate per la valutazione delle emissioni sono:

- consumo di carburante;
- tipo di motore (caldaie a vapore, motori diesel ad alta, media o bassa velocità, turbine e così via ...);
- tipo di combustibile (MDO / MGO, e così via);
- fase di navigazione (crociera, manovra, stazionamento, carico e scarico, rimorchiaggio).

Di seguito si riporta la stima delle emissioni relative alla campagna di acquisizione 2D (Tabella 1.7) e 3D (Tabella 1.8).

Si ricorda che la tempistica relativa all'acquisizione 3D è stata stimata considerando l'intera area a disposizione, pertanto il tempo indicato e la relativa stima delle emissioni sono da considerarsi puramente indicativi, corrispondenti all'ipotesi peggiorativa e del tutto irreale di un'acquisizione sull'intera estensione dei blocchi. Verosimilmente, l'eventuale acquisizione 3D sarà invece concentrata solo in aree specifiche dei permesso di ricerca, andando di fatto a ridurre notevolmente la durata delle attività.

Tipo di nave	Durata acquisizione	Tipo di carburante	Fattore di emissione (kton/Mton)	Consumi di caburante (ton)		Emissioni di CO_2 (kton)	
				Giornaliere	Totali	Giornaliere	Totali
Nave simica 2D	3	Diesel	870	32,9	98,7	0,029	0,087
Nave da supporto	3	Diesel	880	6,0	18	0,005	0,015
Nave da inseguimento	3	Diesel	880	1,72	5,16	0,002	0,0103

Tabella 1.7 – Stima sul consumo di carburante dei vari mezzi impiegati per la campagna di acquisizione 2D e le emissioni di CO_2 (fonte: Polarcus)

Tipo di nave	Durata acquisizione	Tipo di carburante	Fattore di emissione (kton/Mton)	Consumi di caburante (ton)		Emissioni di CO_2 (kton)	
				Giornaliere	Totali	Giornaliere	Totali
Nave simica 3D	300	Diesel	870	32,9	2072,7	0,029	8,7
Nave da supporto	300	Diesel	880	6,0	378	0,005	1,5
Nave da inseguimento	300	Diesel	880	1,72	189	0,002	0,6

Tabella 1.8 – Stima sul consumo di carburante dei vari mezzi impiegati per la campagna di acquisizione 3D e le emissioni di CO_2 (fonte: Polarcus)

A bordo della nave sismica e di quelle di appoggio, saranno regolarmente controllati i fumi di scarico per l'efficienza dei sistemi di combustione ed acquisite le necessarie certificazioni di conformità alle emissioni di inquinanti atmosferici.

Le imbarcazioni di Polarcus sono dotate di speciali convertitori catalitici (*Selective Catalytic Reduction*) atti alla riduzione delle emissioni inquinanti in atmosfera per quanto riguarda gas come la CO_2, NO_2, SO_2. Sebbene la CO_2 sia il gas serra più conosciuto, NO_2 e SO_2 sono di gran lunga i peggiori. NO_2 è uno tra i principali gas serra ed ha un impatto di ~300 volte maggiore di quello della CO_2 per unità di peso.

Il processo di riduzione catalitica adottato nelle navi Polarcus, utilizza urea per ridurre in maniera più efficace il gas NO_2. Questi convertitori catalitici hanno anche effetti positivi sul particolato PM e anche sulle emissioni sonore.

Nel complesso, i convertitori catalitici hanno numerosi effetti positivi tra cui:

- Riduzione NOx: 90-98%
- Riduzione HC: 80-90%
- Riduzione del particolato PM: 20 - 30%
- Attenuazione da inquinamento sonoro: 20 - 35dB (A)

La Figura 1.3 fornisce un confronto approssimativo delle emissioni atmosferiche dei due tipi di carburante.

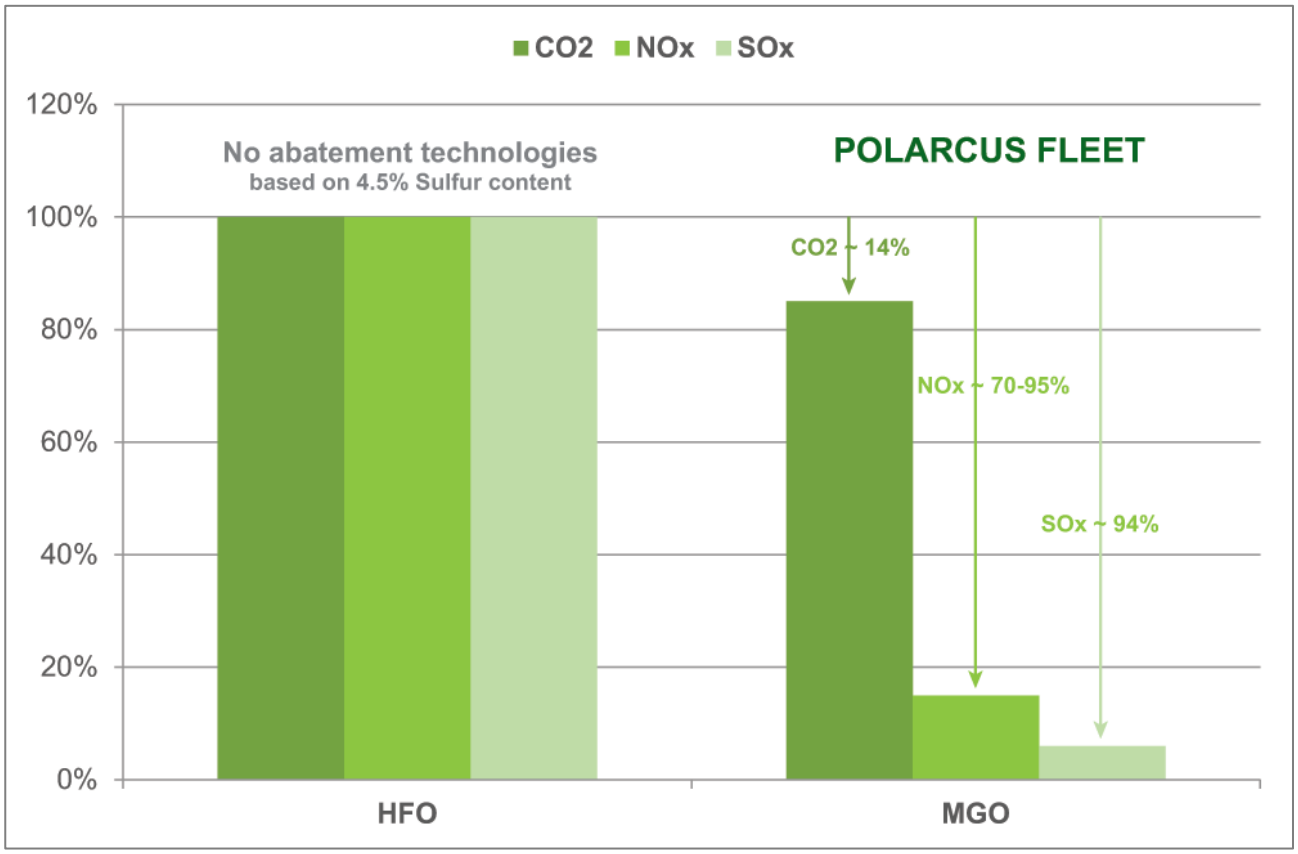


Figura 1.3 – Comparazione tra l'utilizzo di combustibile pesante HFO e gasolio marino MGO con relativo abbattimento delle emissioni di gas nocivi (fonte: Polarcus).

Il tenore di SO_2 è direttamente proporzionale al tipo e qualità del combustibile utilizzato. Si tratta di un gas tossico che contribuisce alla formazione di piogge acide con la formazione di acido solforoso (H_2SO_3) e acido solforico (H_2SO_4). Questi acidi possono provocare gravi danni all'ambiente a causa della loro natura corrosiva.

L'unico metodo principale per ottenere basse emissioni di ossidi di zolfo è quello di scegliere un combustibile, sia MDO o MGO, con tenore di zolfo inferiore. Il combustibile pesante (HFO), ancora

ampiamente utilizzato nel settore ha un elevato contenuto di zolfo in genere intorno al 4,5% S. La società Polarcus ha sin dall'inizio adottato combustibili con tenori di zolfo di circa 0,2% su tutta la flotta.

Gli impatti in atmosfera sulla qualità dell'aria legati dalle attività preposte per questa acquisizione sono da ritenersi trascurabili, considerato che non vi sono punti emissivi fissi e che l'unico impatto in atmosfera può derivare dalle emissioni prodotte dalla nave sismica e dalla nave di appoggio del tutto assimilabili alle emissioni attribuibili a imbarcazioni come i pescherecci che abitualmente transitano nella zona. Inoltre si tratta di un impatto di carattere temporaneo, strettamente legato alla durata delle operazioni.

2 PREVENZIONE DI RISCHI E POTENZIALI INCIDENTI

La politica di gestione e prevenzione di rischi di Polarcus è affidata ad un rigido quadro gestionale, nel quale vengono individuati i possibili rischi relativi alle diverse attività, fornite le seguenti valutazioni e indicate le diverse procedure da esegure.

La corretta gestione del rischio è la prima linea di difesa per proteggere gli operatori, l'ambiente e le diverse strutture in opera.

La gestione del rischio viene fatta a partire dall'individuazione di tutti i pericoli prevedibili, la loro valutazione e le misure di controllo da adottare. L'obiettivo è quello di eliminarli o ridurli ad un livello che sia tollerabile e tanto bassi quanto ragionevolmente possibile (ALARP).

Le misure di riduzione del rischio ridurranno la probabilità di un evento potenzialmente negativo e permettono di mitigare gli effetti riducendo quindi le conseguenze dell'incidente.

Il successo e la buona riuscita di una campagna geofisica sono sostenute da un rigido piano di sicurezza "*HSE Project Plan*" che regola i ruoli e le responsabilità di ogni singolo membro dell'equipaggio. Questo piano di sicurezza detta le procedure e le linee da seguire in caso di emergenza.

La gestione dei rischi ed i potenziali incidenti verrà eseguita dai responsabili della sicurezza, uno interno a Global Petroleum ed un altro della società Polarcus. Prima dell'inizio di qualsiasi attività, ci saranno riunioni tra la Società ed il Contraente per verificare che le rispettive procedure di sicurezza siano conformi con il piano "*HSE Project Plan*".

La sicurezza della nave sarà sempre sotto la responsabilità del capitano.

Il direttore dei lavori "*Contractor Party Manager*" sarà responsabile dell'attuazione del piano di sicurezza "*HSE Project Plan"* e di svolgere e promuovere regolari incontri con tutto l'equipaggio definendo:

- la tipologia di incontri;
- i partecipanti;
- la frequenza con cui si svolgeranno tali incontri;
- gli obiettivi della riunione;
- la stesura di un registro delle riunioni.

Il piano di sicurezza farà riferimento alle norme internazionali, nazionali, regionali e locali nel totale rispetto della legge. Pericoli e rischi verranno valutati utilizzando un sistema di valutazione "*Risk Assessment System"* che può essere aggiornato durante tutte le fasi dell'indagine.

Il sistema di valutazione dei rischi è una parte fondamentale per il piano di sicurezza "*HSE Project Plan*". Esso valuta tutte le singole operazioni considerando:

- il tipo di operazione;
- i rischi ad essa connessi;
- le misure di mitigazione e istruzioni che possono essere attuate per prevenire l'incombere di qualsiasi incidente.

Per quanto riguarda le politiche ambientali, il contraente condurrà tutte le fasi del progetto seguendo le linee guida stabilite da IAGC "*International Association of Geophysical Contractors*" in particolare "*Environmental Guidelines for Worldwide Geophysical Operations – Linee guida per il rispetto ambientale durante le operazioni geofisiche*" e le indicazioni del JNCC "*Joint Nature Conservation Commitee*".

APPENDICE:
Schede tecniche e informative sui mezzi utilizzati da Polarcus

Polarcus Nadia

12 streamer 3D/4D seismic vessel

Overview

Delivered in 2009 Polarcus Nadia is an ultra-modern 12 streamer 3D/4D seismic vessel. Built to the ULSTEIN SX124 design and incorporating the innovative ULSTEIN X-BOW® hull, this vessel combines the latest developments in maritime systems with the most advanced seismic technology commercially available. The vessel is also amongst the most environmentally sound seismic vessels in the market with diesel-electric propulsion, high specification catalytic convertors, double hull, and advanced bilge water cleaning system. This vessel complies with the stringent DNV CLEAN DESIGN notation.

Vessel

- Design: ULSTEIN SX124
- Builder: Drydocks World Dubai LLC
- Date Built: 2009
- Flag: Bahamas
- Classification: DNV 1A1, SF, E0, DYNPOS-AUTR, CLEAN DESIGN, COMF-V (3), ICE-C, NAUT-AW,HELDK
- Helideck: Sikorsky S-61N / S-92
- Length Overall: 88.8m
- Beam: 19.0m
- Max Draft: 6.6m
- Gross Tonnage: 6570t
- Propulsion: Diesel Electric
- Maximum Speed: 14.0 knots
- Bollard Pull: 100t
- Fuel Capacity: 1,540 m3 gas-oil
- Main Engines: 6 x Wartsila 9L20, MCR rating 1800kW at 1000rpm
- Main Propulsion: 2 x Schottel SRP 3030 CP at 3100kW
- Bow Thrusters: 1 x Brunvoll tunnel thruster at 1200kW
1 x Brunvoll retractable azimuth thruster at 850kW
- DP System: Kongsberg K-Pos DP-21 - DPII
- Berths: 60, including 23 single cabins

Navigation & Positioning

- Radar plants: S-band ARPA radar
X-band ARPA radar
- Navigation: ECDIS chart system, DGPS

Communications

- Primary: GMDSS A4
- Secondary: Inmarsat F Fleet-77
- Communication: VSAT

Seismic Systems

- Seismic Source: Bolt Technology 1500-LL/1900-LLXT dual sources
- Marine Compressor: 3 x LMF Compressors
- Streamers: 12
- Streamer Type: Sercel Sentinel solid streamers
- Acquisition System: Sercel Seal Marine Data Acquisition System
- Navigation System: ION Orca
- Streamer Positioning: ION DigiBIRD depth controllers and DigiRANGE acoustics
- Source Controller: Seamap GunLink 4000 fully distributed digital gun controller

Triple-E 2 DNV ENVIRONMENTAL & ENERGY EFFICIENCY RATING

Polarcus Naila

14 streamer 3D/4D seismic vessel

Overview

Delivered in 2010 Polarcus Naila is an ultra-modern 14 streamer 3D/4D seismic vessel. Built to the ULSTEIN SX124 design and incorporating the innovative ULSTEIN X-BOW® hull, this vessel combines the latest developments in maritime systems with the most advanced seismic technology commercially available. The vessel is also amongst the most environmentally sound seismic vessels in the market with diesel-electric propulsion, high specification catalytic convertors, double hull, and advanced bilge water cleaning system. This vessel complies with the stringent DNV CLEAN DESIGN notation.

Vessel

- Design: ULSTEIN SX124
- Builder: Drydocks World Dubai LLC
- Date Built: 2010
- Flag: Bahamas
- Classification: DNV 1A1, SPS, BWM-T,TMON, SF, E0, DYNPOS-AUTR, CLEAN DESIGN, COMF-V (3), ICE-C, NAUT-AW,HELDK
- Helideck: Sikorsky S-61N / S-92
- Length Overall: 90.8m
- Beam: 19.0m
- Max Draft: 6.6m
- Gross Tonnage: 6667t
- Propulsion: Diesel Electric
- Maximum Speed: 15.0 knots
- Bollard Pull: 155t
- Fuel Capacity: 1,540 m3 gas-oil
- Main Engines: 6 x Wartsila 9L20, MCR rating 1800kW at 1000rpm
- Main Propulsion: 2 x Berg CPP at 3700kW
- Bow Thrusters: 1 x Brunvoll tunnel thruster at 1200kW, 1 x Brunvoll retractable azimuth thruster at 850kW
- Stern Thruster: 2 x 400kw
- DP System: Kongsberg K-Pos DP-21 - DPII
- Berths: 60, including 23 single cabins

Navigation & Positioning

- Radar plants: S-band ARPA radar, X-band ARPA radar
- Navigation: ECDIS chart system, DGPS

Communications

- Primary: GMDSS A4
- Secondary: Inmarsat F Fleet-77
- Communication: VSAT

Seismic Systems

- Seismic Source: Bolt Technology 1500-LL/1900-LLXT dual sources
- Marine Compressor: 3 x LMF Compressors
- Streamers: 14
- Streamer Type: Sercel Sentinel solid streamers
- Acquisition System: Sercel Seal Marine Data Acquisition System
- Navigation System: ION Orca
- Streamer Positioning: ION DigiBIRD depth controllers and DigiRANGE acoustics
- Source Controller: Seamap GunLink 4000 fully distributed digital gun controller

Polarcus®

EXPLOREGREEN™

Our Company

Polarcus is a pure play marine geophysical company with a pioneering environmental agenda, specializing in high-end towed streamer acquisition from Pole to Pole.

Our unique seismic fleet is at the forefront of maritime and seismic innovation, well positioned to meet the current and future demands of the industry. Our worldwide Contract service capabilities encompass conventional 3D surveys, broadband data acquisition, sophisticated wide and multi-azimuth projects, and high density 4D production surveys. To complement these services we are expanding our global Multi-Client Projects Library with several projects now available for data license or underway in the UK, Norway, and Africa. To complement our marine services offering we have formed a partnership with the leading data processing company GX Technology to offer clients a full seismic data services solution, including on-board services and broadband processing. Our operations are global and we aim to be the service provider of choice in areas of high environmental sensitivity including the Arctic Ocean.

The expansion of the industry into frontier and environmentally sensitive sea areas is today driving a much higher level of environmental compliance worldwide as new legislation on emissions to air and water are developed and introduced. Our ultra-modern fleet, investments in "green" technologies within both maritime and seismic, and our commitment to a pioneering environmental agenda will help our clients to work safely and efficiently within these constraints.

Sustainable Business Practices

Companies doing business today are increasingly being held accountable by clients, shareholders, and the public at large for their approach to corporate social responsibilities.

Polarcus being a relatively new entrant to the marine geophysical services industry is committed to enter the sector in a sustainable fashion by demonstrating a systematic management approach towards corporate responsibility, for our business decisions and through our operations. By this we will stay ahead of expectations in all facets of Corporate Social Responsibility - environmental, social and economic. Polarcus is well aware that we are held directly responsible for our actions, from the ethical behavior of our employees and our supply chain to our impact on the community at home and abroad.

Polarcus holds the ISM Document of Compliance and we are certified to the ISPS Standards. In addition our office and vessels have achieved DNV certification to the following internationally recognized standards; ISO 9001, ISO 14001 and OHSAS 18001.

No other geophysical company in the industry has undertaken such a project to have their Management System fully certified to the internationally recognized standards of ISM, ISPS, ISO and OSHAS. Uniquely in the seismic industry to date, the Company has secured the full suite of certification for the entire Polarcus Group, including both maritime and seismic across the full Polarcus fleet of vessels.

Going Green Demands Global Solutions

The challenges of climate change, the protection of species and sustainable development have become global concerns. Whilst alternative energy solutions are sought, our world remains dependent for energy on hydrocarbons and our industry has a key stewardship role to play in making every effort to operate in an environmentally responsible manner.

At Polarcus we approach this from the perspective of concerned citizens and the company as a whole seeking global solutions and we recognize that we must be willing to invest now in order to avoid negative future consequences of inaction. We are well aware that we have a significant opportunity within the maritime sphere of our industry to perform our work cleaner and greener. Our goal is to rise up and meet this challenge head on.

Polarcus has built an environmentally responsible company which has become a model for others. Our beliefs are embedded in our corporate values of Responsibility, innovation and excellence, and are apparent throughout the corporate lifecycle from the design of our seismic fleet through their operation, to their eventual recycling. Our corporate values are the foundation for what we call "our pioneering environmental agenda". To be a pioneer we choose to lead by example.

Achieving the Goal

In order to be a socially responsible company, Polarcus has adopted a GSTIC framework approach (Goals, Strategy, Tactics, Implementation and Control) to link specific tasks at the departmental level to the environmental objectives that form part of our corporate goal. Through these means, and with the appropriate reviews and controls, we establish visibility and accountability for our endeavors that help us address:

- working conditions including occupational health and safety
- security conditions including people and property
- environmental resources and initiatives
- organizational governance

By partnering with Polarcus for your marine seismic acquisition projects we can work together to begin the journey towards sustainable business practices and project excellence.

Reducing harmful emissions

Since the advent of modern maritime transport, the emissions of noxious gases and other pollutants have gone largely unnoticed and by virtue of its international nature generally outside the reach of most national laws controlling pollution. Today there is a rapidly increasing awareness of the issue and government regulators are starting to introduce legislation that seeks to control these harmful emissions. A recent study published by the European Commission suggested that pollutants due to shipping were reducing the average lifespan of every European by several months with particulates of soot and the compounds of sulfur and oxygen being some of the primary culprits. As a result the European Union is planning Europe's first low-emissions marine zones, designed to cut pollution from shipping in certain designated areas of the North Sea, English Channel and the Baltic Sea from 2015.

At Polarcus we take these concerns seriously and have invested in a number of systems and technologies to substantially reduce harmful emissions, in some cases by up to 98% and have adopted vessel design features such as a double hull to reduce the risk of accidental pollution to sea. All our seismic vessels at Polarcus meet the stringent Det Norske Veritas (DNV) CLEAN-DESIGN and BWM-T notations that regulate emissions to air and water. We have also received a DNV Vessel Emissions Qualification Statement verifying our ability to accurately measure and report specific emissions data, enabling us to optimize in real time our operational performance in order to reduce our total emissions footprint. The Polarcus fleet also carries the International Maritime Organization (IMO) Green Passport that regulates environmental and occupational health and safety risks through the life of the vessel, from shipbuilding to eventual recycling.

CLEAN-DESIGN

The CLEAN-DESIGN notation requirements are intended to reduce and limit the ship's air emissions and sea pollution. In addition, the CLEAN-DESIGN notation stipulates defensive design, accident prevention and consequence limitation requirements, thus providing additional environmental protection.

Benefits

For owners interested in promoting an environmental profile, the notation confirms a higher environmental standard. By adopting the CLEAN-DESIGN notation, the owner clearly demonstrates that they have acted to limit emissions, and operational and accidental pollution by taking proactive steps to responsibly build, operate and manage their assets.

Features

The CLEAN-DESIGN notation stipulates requirements for controlling and limiting operational emissions and discharges. These requirements cover the most important environmental aspects:

- Protection of fuel tanks from grounding damage
- Handling of sewage and garbage
- Handling of ballast water
- Handling of fuel oil
- Environmentally friendly antifouling & hull coatings
- Combustion machinery emissions (NOx and SOx)
- Use of refrigerants
- Green Passport Inventory for recycling the ship

The notation also stipulates requirements for controlling and limiting operational emissions and discharges covered by the class notation CLEAN.

Advanced environmental technologies

- SCR Catalytic Reactor (reducing the engine emissions for NOx, HC, Soot and Sound). Revised Marpol Annex VI though not required on new builds until 2016.
- The SCR System can reduce:
- NOx: 90 - 98%
- Hydrocarbons: 80 - 90%
- Soot particles: 20 - 30%
- Sound attenuation: 20 - 35db(A)
- Bilge Water Separator (superior cleaning reaching < 5ppm instead of regulatory 15ppm)
- The onboard garbage incinerator maintains an efficient operating temperature and may be safely loaded while in operation, requiring less cold-starts therefore reducing emissions.
- Fuel Overflow tank system

Fluid free streamer systems

The Sercel Sentinel® solid streamer design offers significantly improved noise performance over fluid-filled sections, especially during periods of marginal weather conditions, thereby extending the data collection window. This uniform solid construction provides crush and impact resistance, skin support against puncture and distributed loading during streamer deployment and retrieval.

Where applied, the ION DigiFin® steerable streamer system combined with the Polarcus infill management system will reduce infill thereby reducing the overall time on survey and the consequent energy requirements.

Emissions footprint

Polarcus will use where available low sulfur marine gas oil to limit the emissions of SOx compounds.

Polarcus received in Q2 2010 a Det Norske Veritas Vessel Emissions Qualification Statement. This qualifies the Polarcus emissions reporting methodology and accuracy of data, verifying the company's ability to predict the exhaust emissions footprint for any project and then, post-project, to subsequently provide actual emissions measurements. The results provide Polarcus with a real time ability to optimize operational performance during the course of a survey in order to reduce the overall emissions footprint. The data will also prove valuable to clients who wish to document or report specific emissions measurements such as NOx gases, or who are seeking to meet specific emissions reduction targets.

ITEMS REVIEWED:
The following specific operational data is measured onboard by Polarcus:

- Engine specifications (kW)
- Power produced and consumed (kWh)
- Fuel specifications
- Sulfur % (m/m)
- Carbon content % (m/m)
- Density (kg/m3)
- Fuel consumption (L/h, g/kWh, m3)
- NOx emissions pre and post treatment (kg)
- Urea consumption (kg)
- SOx emissions (kg)
- CO2 emissions (kg)

Environmentally friendly oils

To minimize the impact of its activities on the environment, Polarcus has opted to use the Castrol Bio Range high performance 'green' lubricants to help reduce our environmental footprint and protect the world's oceans.

IMO Green Passport

Reducing environmental, occupational health and safety risks related to ship construction, management, operations and eventual ships recycling by:

- Minimizing the use of, or introducing alternative products for all hazardous substances normally utilized in the ship building process.
- Minimizing the hazardous material generated during the operating life of the ship through product reformulation, cleaner production technologies, process modification, input substitution and by the use of a closed loop recycling system
- Maintaining a life time inventory of materials known to be potentially hazardous to human health or the environment which were used in the ship construction, operationally generated or onboard as part of the ships stores

The Green Passport also requires a company to ensure a designated Environmental Officer is available to provide guidance and support in maintaining this classification through the life-cycle of the ship.

First Triple-E™ 'Level 1' in the world

DNV's Triple-E™ is a voluntary environmental performance rating scheme for ships, independent of class, age and flag.

The key measures of Energy & Environmental Efficiency include :

- Environmental management practices
- Fuel efficient operations
- Energy efficient vessel design
- Verifiable monitoring, measurement and documentation

Triple-E™ has four levels with '1' as the highest

Polarcus has the distinction of being the first vessel owner and operator to be awarded level 1 certification under the Triple-E™ performance rating scheme.

Eliminating invasive species

Emissions to air are only one part of the issue in today's environmentally conscious world. A new issue that is starting to gain recognition around the world is the equally damaging discharge of untreated ballast water that causes the introduction of invasive marine species into new environments. This standard practice has been identified by the International Maritime Organization as one of the four greatest threats to the world's oceans, on par with land based sources of marine pollution, the overexploitation of living marine resources and the physical destruction of marine habitat.

When invasions do occur, the consequences are often severe. In the United States for example the invasive Zebra mussel has cost the government billions of dollars to clear whilst in the Black Sea and the Baltic, the Mnemiopsis leidyi comb jelly have depleted native plankton stocks and collapsed commercial fisheries. Toxic dinoflagellates, commonly known as "red tide" algae, can also be transported via ballast water and are harmful to humans when consumed via contaminated shellfish.

In response the International Maritime Organization is introducing new regulations some commencing from 2010. At Polarcus we are taking the concerns seriously and have fitted the IMO's first type-approved ballast water treatment system now on five of our seven vessels. These five vessels also carry a high ice class designation and will be operating at times in the Arctic, an area where the effects of invasive marine species could be especially damaging to the local environment.

BWM-T

This class notation for Control and Management systems for ships´ Ballast Water and Sediments ensures compliance with the International Convention for the Control of Ships' Ballast Water and Sediments, which has not yet entered into force, and covers the ballast water treatment system onboard all ships.

The transfer of foreign ballast water is perceived to be one of the biggest environmental concerns in the maritime industry today. Foreign ballast water being discharged untreated contaminates local harbors and tributaries wreaking havoc on local ecosystems, posing a serious threat to human health and negatively affecting local economies.

Benefits

This class notation is a suitable specification to ensure compliance with the Ballast Water Convention related to ballast water treatment systems, which is likely to enter into force for all ships in the near future.

Features

The BWM-T rule standard ensures that the arrangement used for ballast water treatment is designed according to IMO guidelines for the approval of Ballast water management systems.

Polarcus has opted for the Alfa Laval PureBallast water management system that offers ballast water treatment that is 100 % chemical free. No chemical additives are involved, and no chemicals are produced during Ballast operation.

Ballast treatment occurs within a closed chamber through a process based on a patented form of advanced oxidation technology (AOT), in which radicals are generated. These radicals are highly reactive, which means they instantaneously neutralize microorganisms and organic contaminants. However, the short-lived radicals exist for only a few milliseconds, so they have no possibility of leaving the reaction chamber nor causing further harm to the ecosystem.

Concern for cetaceans

The proximity of seismic operations to marine mammals and the effects that the source arrays might have on their wellbeing has long been studied and debated. Whilst research into this subject is still ongoing, mammal disturbance mitigation will continue to be a high priority for Polarcus.

In addition to complying with the applicable local regulatory requirements for the protection of marine mammals in or around seismic operations, Polarcus follows standard industry practices for soft start procedures across all seismic operations. Polarcus also has a Passive Acoustic Monitoring (PAM) system, designed to detect the presence of marine mammals by listening for their calls, available onboard all our seismic vessels.

Furthermore, Polarcus advocates performing a source test at the beginning of each survey to determine the minimal source size required to provide optimal signal-to-noise to meet the geophysical objectives within a given survey area. Polarcus is also a sponsor and active participant in the IAGC Global Sound and Marine Life Workgroup and the OGP IAGC E&P Sound & Marine Life Task Force.

Improving onboard environment

Another form of harmful emission is noise, commonly accompanied by vibration. The effects can be harmful to both personnel and equipment onboard, and consequently have a detrimental effect on productivity. Frequent and damaging vibration can result in more equipment failures, resulting in survey down-time and unscheduled port-calls.

At Polarcus all our vessels have been designed with the distinctive ULSTEIN X-BOW® that provides for faster vessel transit speeds and smoother passage through water. This helps limit the damaging consequences of noise and vibration, enabling our vessels to comply with the requirements of the Det Norske Veritas (DNV) notation, COMF-V(3).

ULSTEIN X-BOW®

Environment:

- Reduced speed loss by entirely eliminating the crashing of waves against the foreship, leading to increased transit speeds
- Reduced power consumption
- Improved fuel efficiency both in waves and still water

Operation:

- Low pitch and heave accelerations
- Higher operability in head and following seas
- Safer and more comfortable workplace for crew
- Reduced tugging of in-sea equipment

Safety:

- Less sea spray due to water not being thrown forward, improving visibility and reducing icing
- Negligible occurrence of green water on upper and bridge deck
- Low acceleration levels
- Less crew fatigue, reducing slips, trips, fall and lifting incidents
- Safer recovery of in-sea equipment

Comfort:

- Elimination of bow impact and slamming in foreship
- Reduced noise and vibration levels

COMF-V (3)

To comply with a set of criteria for noise and vibrations (V) that influence the well-being of crew and passengers, as well as those affecting the safety and operability of the vessel.

Benefits

Comfort on board a vessel is a most important quality. A less stressful working environment coupled with a higher level of comfort increases the performance, alertness and well-being of the crew, helping to ensure the safety of the ship and its equipment.

Features

Vessels that fulfill the requirements applicable to this notation will be given the class notation COMF-V (3). The requirements for onboard noise and vibration limits are divided into three groups depending on the level of comfort achieved, where comfort rating number (3) represents an acceptable level of comfort. Compliance with the rules is to be verified through measurements of specified noise and vibration parameters.

The requirements for the notation are specific for the various ship types, and are furthermore divided into groups for specified locations. The main parameters used to describe the comfort level are: noise, sound insulation, impact sound insulation and vibrations.

A test program is to be approved prior to the verification measurements. The test program must as a minimum include the following information:

- Specification of measurement locations
- Required loading conditions
- Required operating conditions for machinery
- The instrumentation to be used

Additional steps to reduce noise

- Further noise reduction of 20 - 35db has been achieved through the installation of SCR Catalytic Reactors

Assuring vessel integrity

For many years the seismic industry has been dominated by the use of conversions and older vessels. The integrity of many of these older vessels, all with single hulls, belies the increase in crew numbers and equipment that characterizes a modern multi-streamer 3D seismic vessel.

The Polarcus vessels also holds the DNV 2008 SPS notation, a class notation implemented to classify Special Purpose Ships.

At Polarcus we have taken a number of measures that enable us to provide additional protection for vessel integrity, including double hulls on all vessels and the additional requirements for compliance that enable our vessels to meet the DNV SF notation for controlled stability and floatability.

Minimizing risk in Arctic waters

The Arctic Ocean presents often extreme hazards to seismic operations that can substantially increase risks to both the crew and to the environment. Conscious of these risks and aware that the industry is expanding into this new frontier Polarcus has built the industry's first true 'Arctic Standard' 3D seismic vessels.

Incorporating such design features as a double hull, ICE-1A and ICE-1A* class notation, DP2 dynamic positioning, advanced ballast water treatment, and a host of other innovative features, the Polarcus vessels can mitigate many of the everyday hazards of working in the Arctic and enable us to safely and responsibly make the most of the short operating season.

Polarcus has also received a Statement of Qualification from Det Norske Veritas (DNV) to qualify Polarcus' Arctic operating procedures according to industry best practice and relevant standards. These procedures have been developed with assistance from DNV to further mitigate risks operating in Arctic waters.

ICE-1A & ICE-1A*

Benefits

A vessel which can operate in the Northern Baltic or similar areas in the winter season. Assistance from Ice Breakers is assumed when navigating in icebound waters.

Features

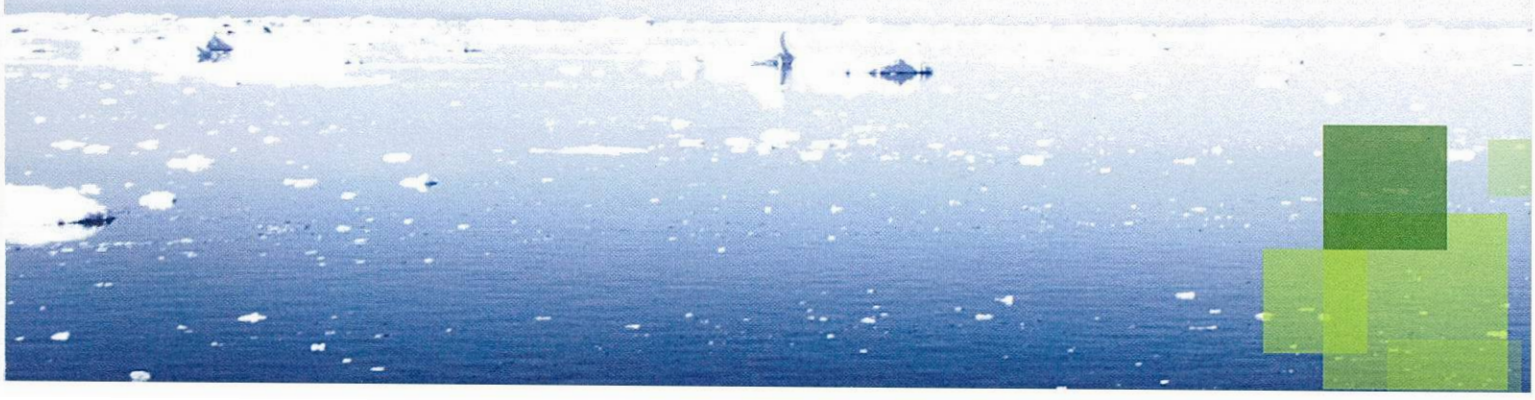
DNV's Baltic rules are applicable to ships operating in broken channels made by icebreakers in first-year ice or in open waters with small ice floes. The following areas are subject to requirements:

- Hull – ice belt
- Machinery output
- Shaft – System
- Propeller
- Mooring
- Heating of ballast tanks
- Sea chest
- Rudder and steering gear
- Corrosion protection

The notation verifies the vessel has sufficient strength, engine power and equipment to operate in the specified ice conditions.

DNV ice class ICE-1A is accepted by the authorities as being equivalent to the Finnish Swedish Ice Class 1A.

DNV ice class ICE-1A* is accepted by the authorities as being equivalent to the Finnish Swedish Ice Class 1A Super.



Grounding avoidance

Statistics show groundings and collisions amount to almost 50% of all serious ship casualties and the majority of these incidents are categorized as being due to human error. The main objective of the NAUT-AW notation is to avoid bridge system failures by addressing both technical and human-related issues, with a particular emphasis on tasks related to navigation in narrow and congested waters, and areas with complex offshore infrastructure.

At Polarcus, all our vessels have the Det Norske Veritas (DNV) NAUT-AW class notation for enhanced nautical safety, incorporating a grounding avoidance system.

NAUT-AW

Benefits

The NAUT-AW notation sets a bridge standard intended to reduce the risk of failure in bridge operation whether the navigational watch is carried out by a single navigator or several persons acting as a bridge team.

Modern navigational equipment is becoming increasingly complex and DNV's NAUT-experts are for this reason called upon for verification of the integrated navigation system being installed on NAUT-AW ships.

A thorough documentation of the ship's maneuvering characteristics is available.

Independent studies conclude that there is a significant reduction in the risk of collisions and groundings for ships that have DNV additional class notations for nautical safety.

Features

The notation regulates the factors affecting the safe performance of the bridge operation, e.g.; wheelhouse design, workstation arrangement, navigational equipment, human-machine interface, working environment, etc. to ensure a reliable bridge system in various modes of operation.

The notation also calls for a grounding avoidance system to improve navigational safety and reduce the workload in narrow waters. In addition, the ship has to undertake trials to provide broad documentation of its maneuvering characteristics.

Safety through redundancy

History has shown that main engine and electrical power failures are relatively common occurrences with the vessels operating in the seismic industry, and when these occur, the entanglement or loss of streamers, or the likelihood of drifting in areas of high infrastructure such as offshore oilfield installations, presents major risks to personnel, assets and the environment.

At Polarcus, our vessels have multiple main engines, independent propeller shafts or azimuth thrusters and split switchboards and additionally all carry the Det Norske Veritas (DNV) notation DYNPOS-AUTR that warrants the vessels have a redundant dynamic positioning system and an independent joystick system back-up. Taken together these features substantially reduce the risk of loss of control of the vessel, potentially enabling the operators to secure lower insurance premiums for operations around infrastructure, and enabling the safe recovery of in-sea equipment.

DYNPOS-AUTR

The dynamic positioning system is regarded as the complete installation necessary for dynamically positioning a vessel, including the power system, thrusters, DP-control system and independent joystick system. The class notation correlates to IMO equipment class 2 for vessels with a Dynamic Positioning System.

Benefits

The notation ensures that the vessel has an arrangement that is sufficient to meet class requirements and IMO guidelines for Dynamic Positioning Systems. This notation enables the customer to offer services in operations requiring Dynamic Positioning equipment class 2. This allows for optimum vessel maneuverability and system redundancy when engaged in multi-vessel operations or carrying out seismic acquisition in or near congested shipping lanes and oil field installations.

Features

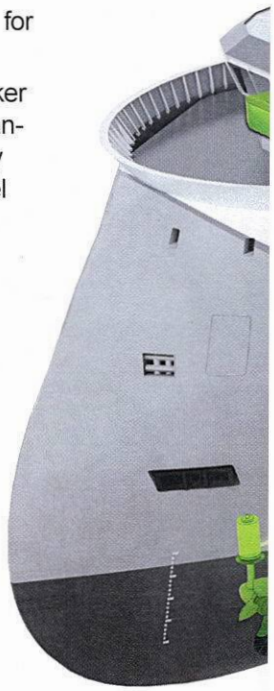
The following additional documentation is applicable:

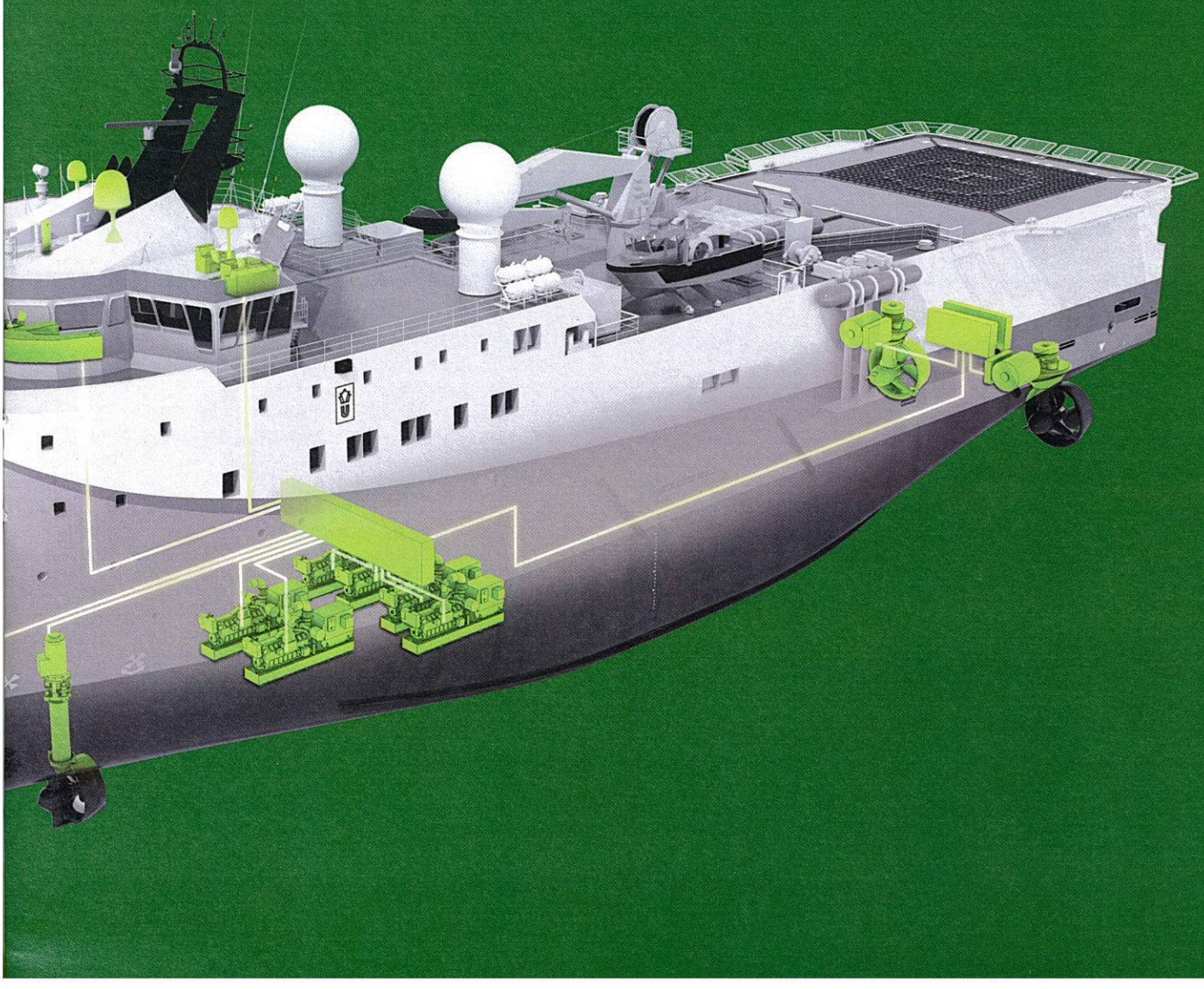
- Instrumentation and automation; dynamic positioning control and monitoring system, independent joystick system, thrusters, mode control selection, position reference systems and sensors, power management system
- DP-control centre arrangement and layout documentation
- FMEA - Failure mode and effect analysis and test program
- Programs for test and trials
- Electric power system documentation; such as electrical load calculation during dynamic positioning operation
- Calculation of the environmental regularity numbers, i.e. the ability to keep in position relative to weather conditions.

The scope related to the DP notation covers certification of the DP systems, verification/review of the related machinery systems and comprehensive testing of the DP functionality. The notation includes FMEA requirements. The scope includes a thorough review of the FMEA and subsequent testing.

Additional safeguards

- Twin independent Propulsion, with Controllable Pitch Propellers (CPP)
- One retractable azimuth thruster forward with CPP
- One bow thruster
- One stern thruster
- Highly efficient Diesel Electric Power Management System with split switchboard for increased redundancy & efficient operations
- Propulsion system & PMS optimized for seismic operations.
- Where rudders are installed the Becker King Support Rudder bearings guarantee the best possible maneuverability of the vessel with lowest possible fuel consumption. The rudder is guaranteed free from flexural vibration and is proven to have the best values for natural vibration
- Our frequency converter driven high pressure air compressors increase the efficiency of the high pressure air system source supply providing redundancy while also reducing atmospheric emissions





Polarcus Principles

Polarcus Principles identify and provide mitigation measures for areas of elevated risk to our people, the environment, our property, our reputation and the security of our operations. Polarcus Principles must be respected and enforced by all those working with Polarcus. It is an obligation of all employees and suppliers to intervene if Polarcus Principles are violated.

Environment Health Safety & Quality

A Safety Pioneer

Polarcus is a pioneer in the marine seismic exploration industry, responsibly expanding our operations without harm to our world. This practice is rooted in the company's core values of responsibility, innovation and excellence.

Our management system is based on OGP 510 encompassing the 4 basic fundamentals of leadership, managing risk, continual improvement and Implementation together with 10 elements in a Plan, Do, Check and Act process.

Management of Risk

Risk management is employed throughout our business cycle. The Polarcus goal and our belief is zero harm to people and the environment. Our management team is responsible for providing a consistent risk management framework in which the risks concerning company business activities are identified, considered and addressed in key approval, review and control processes.

Proper management of risk is the first line of defense for protecting our people, the environment, our property and our reputation from those risks of significant likelihood and consequence in the pursuit of our strategic goals and objectives. Risk management is achieved through the identification of all foreseeable hazards, assessing them and implementing mitigation measures. Through risk management, we aim to eliminate or reduce risk to a level that is both tolerable and As Low As Reasonably Practicable ("ALARP").

Management System Certification

Polarcus launched its management system in Q1 2009 and since that time we have expanded and matured to a full-fledged and DNV GL certified management system. We now hold the ISM Document of Compliance and we are certified to the ISPS Standards.

In addition our office and vessels maintain DNV GL certification to the following internationally recognized standards;

- ISO 14001:2004 - Environmental Management
- OHSAS 18001:2007 - Occupational Health and Safety
- ISO 9001:2008 - Quality Management

DNV

NORWEGIAN ACCREDITATION
MSYS 002

ISO 9001/ISO 14001/OHSAS 18001
CERTIFIED COMPANY

No other geophysical service provider has a management system fully certified to the internationally recognized standards of ISM, ISPS, ISO and OSHAS. Uniquely in the seismic industry to date, we have have secured the full suite of certification for the entire Polarcus Group, including both maritime and seismic operators across the entire Polarcus fleet of vessels.

Explore Green™

Leading the industry, responsibly.

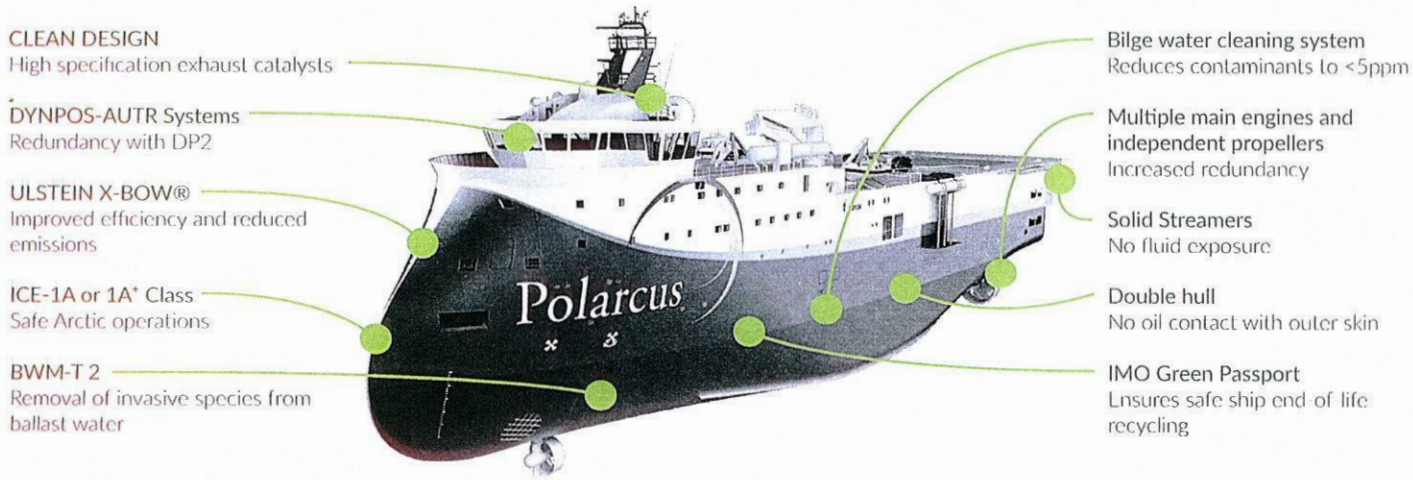
Climate change, protection of species and habitat, and sustainable development are global challenges. Our world remains dependent on hydrocarbons for energy and our industry has an obligation to make every effort to operate in an environmentally responsible manner.

In the marine seismic sector there are four primary types of emissions or pollution: solid, fluid, gaseous, and acoustic. The primary source of these emissions is the survey vessel itself and the seismic acquisition systems.

Explore Green™ encapsulates our leading technologies, accreditations and certifications, practices and procedures. It is our belief and culture. It provides the framework for responsible exploration on our journey to turn our vision, "To be a pioneer in an industry where the frontiers of seismic exploration are responsibly expanded without harm to our world" into reality.

Environmental protection by design

Each of our vessels has been specifically designed in support of our vision and our fleet comprises the most environmentally advanced vessels in the world. Each vessel is outfitted with exhaust emissions reducing ("SCR") technologies and advanced ballast water treatment systems to safely eliminate Harmful Aquatic Organisms and Pathogens ("HAOP"), more commonly referred to as invasive species. All of our vessels comply with the DNV GL Clean-Design (Class) notation demonstrating our commitment to limit emissions and both operational and accidental pollution.



Managing emissions to sea

Polarcus was the first seismic company to hold the DNV GL BWM-T class notation. All of our vessels operate a ballast water management system which is 100% chemical free ensuring our ballast water operations remain free of HAOP.

Each of our vessels are using highly biodegradable, low toxicity, low bioaccumulation oil in all open deck hydraulic systems, significantly reducing the impact of any potential spill to the sea in event of system failure.

The effects of seismic operations on the behavior of marine mammals has long been studied with no definitive conclusions or evidence to suggest either temporary harm or chronic effects. Whilst research on the subject continues, mitigating marine mammal disturbance is a high priority for Polarcus. We were the first seismic operator in the industry to have Passive Acoustic Monitoring ("PAM") systems permanently installed on our vessels.

Explore Green™

Leading the industry, responsibly.

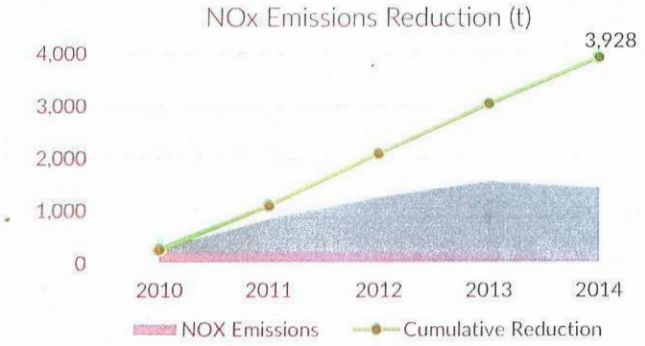
Managing our emissions to air

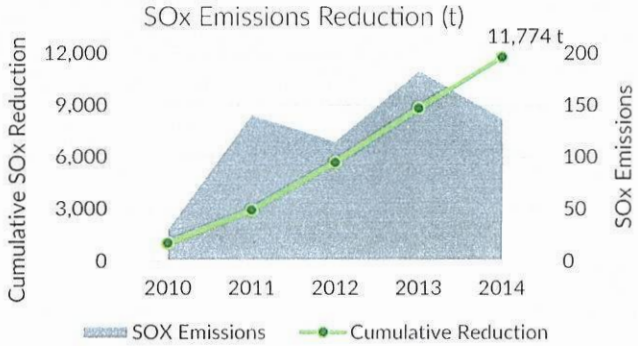
The primary exhaust gas pollutants from ships, sulfur oxides (SOx) and nitrous oxides (NOx) as well as CO2, not only cause cumulative negative effects to global environmental quality, they are among the contributing anthropogenic drivers of climate change.

At Polarcus we are driven by our vision and values and are committed to being an industry leader in responsible exploration. We have developed a DNV GL certified tool not only to help us measure our emissions footprint, but to guide us in our mitigation and reduction efforts. For each project an emissions certificate is produced and made available to our clients. Through technology, certified monitoring and reporting tools, operating efficiency and operating practice, we lead our industry in measuring, monitoring and reducing our emissions to air.

The selective catalytic reduction ("SCR") systems on all of our vessels have prevented more than 3,900 cumulative tons of NOx emissions since we began operations in 2010. This is equivalent to more than 500 round-the-world flights on a Boeing 777.

We are the only marine seismic company in industry committed to using low sulfur marine gas oil ("MGO") throughout our global operations, including our support vessels. By using low sulfur distillates we have prevented more than 11,000 cumulative tons of SOx emissions compared with the global average. What we have prevented in SOx emissions in 5 years is equal to 20 years of SOx emissions produced from an average vessel.





DNV GL Triple-E™

As a pioneer in environmental responsibility, we have elected to participate in the DNV GL Environment, Energy, and Efficiency ("Triple-E™") voluntary rating initiative. Triple-E™ is a mechanism for ships to be certified based on quantifiable verification of their environmental performance and it serves as a tool to help ship owner's benchmark and improve environmental performance.

It is comprised of four levels, from level 4 to level 1, with level 1 being the highest. The key elements of the Triple-E™ rating initiative are:

- Energy efficient ship design
- Environmental management system
- Onboard energy efficiency management
- Supported International Maritime Oraganization initiatives for pollution control
- Verifiable measuring, monitoring and reporting

Our fleet represents the only Triple-E™ rated vessels in the seismic industry and the only Triple-E™ Level 1 rated vessels of any type in the world.

At Polarcus we believe that collectively as an industry we must be willing to invest now in environmentally sustainable operating practices in order to avoid the future negative consequences of inaction.

Polarcus®

Corporate Social Responsibility Report 2014

A Message from our CEO

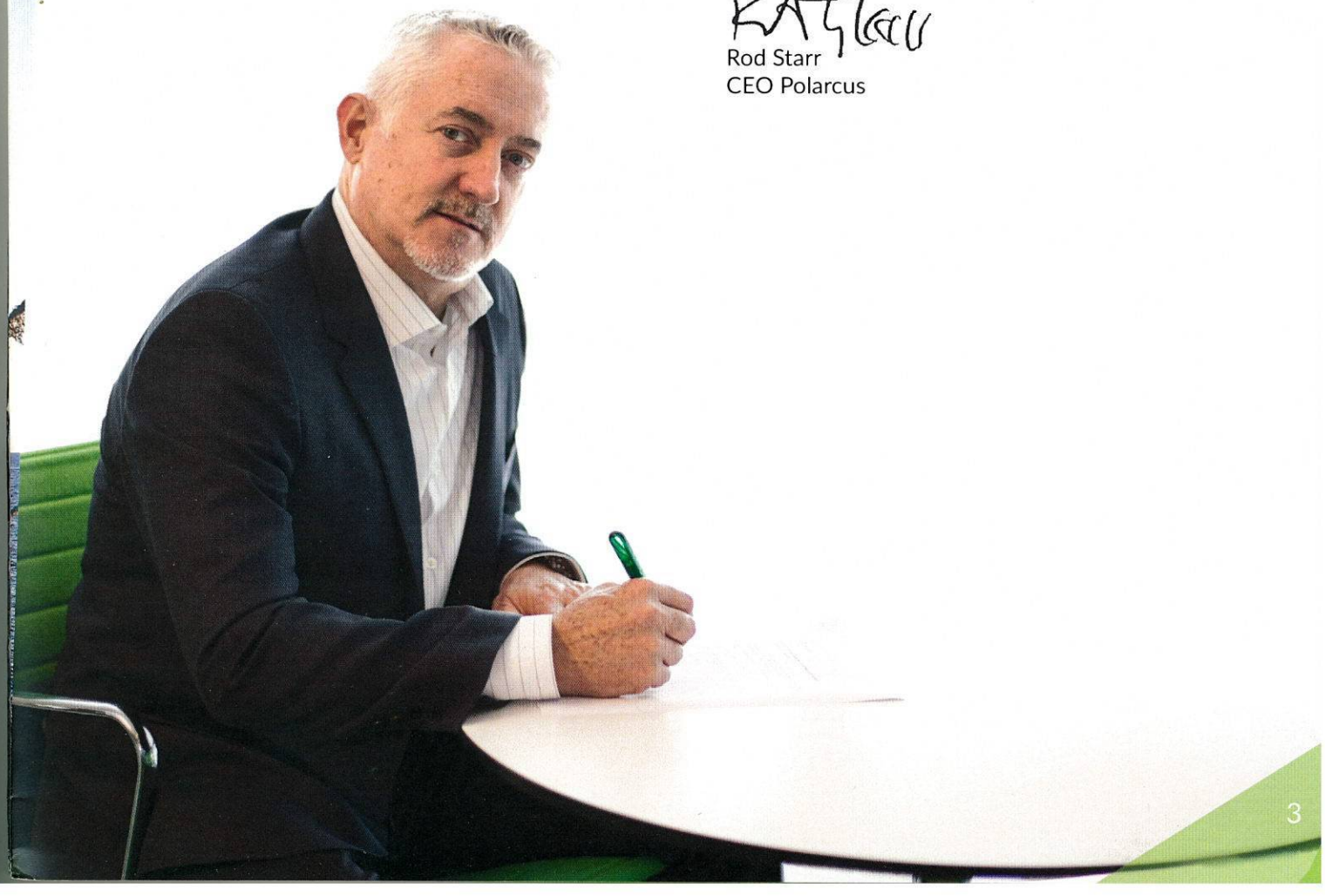
Our vision at Polarcus is to be a pioneer in an industry where the frontiers of seismic exploration are responsibly expanded without harm to our world. We believe this is central to the continued successful conduct of our business and furthermore defines the very essence of our company, what we call 'Being Polarcus'.

Underpinning this vision are our core values of Responsibility, Innovation, and Excellence. We are part of the world community and these values are intended to describe clearly our responsibilities to all our stakeholders and to guide us towards turning our vision into reality. All of us at Polarcus take these values to heart, empowering our team to deliver superior performance whilst demonstrating leadership in environmental responsibility.

In this corporate social responsibility report you will read about our commitments to our customers, our employees, our shareholders, and to the communities amongst whom we live and work. We show how we demonstrate our values in practice, and how we strive earnestly each and every day to deliver on our vision. We are proud of what we have achieved since our inception in 2008, and we will continue to focus on delivering even greater excellence in the years ahead. We never forget that our business is about imaging tomorrow's energy, responsibly and efficiently, for the benefit of everyone in the world community.

We hope you find the report informative and useful.

Rod Starr
CEO Polarcus



Defining Corporate Social Responsibility

Corporate Social Responsibility ("CSR"), is a widely used term which is defined in many different ways. CSR is sometimes also referred to as "Social Responsibility", "Corporate Conscience", "Citizenship", "Social Performance" or "Sustainable Responsible Business".

Polarcus is not a Norwegian company but we are listed on the Oslo Stock Exchange (OSE:PLCS) and follow Norwegian guidance on Corporate Social Responsibility reporting.

The Norwegian Corporate Governance Code does not offer a concise definition of CSR but rather identifies it by the following statement: "At the core of the concept of corporate social responsibility is the company's responsibility for the manner in which its activities affect people, society and the environment, and it typically addresses human rights, prevention of corruption, employee rights, health and safety and the working environment, and discrimination, as well as environmental issues."

The Norwegian Accounting Act Section 3-3c requires Norwegian companies to report on CSR and refers to CSR as human rights, labor rights and social conditions, environmental issues and the combat of bribery and corruption.

As a reflection of various rules and guidelines, the principles and activities included in a Corporate Social Responsibility reporting initiative vary greatly and are largely for the individual company to decide based on the company culture and ambition.

Polarcus Corporate Social Responsibility

At Polarcus, CSR is embedded in the Company Vision and Values as well as in Our Commitments. This report describes how we comply with our vision, core values, and commitments at every level of our business.

The Polarcus vision is:

"to be a pioneer in an industry where the frontiers of seismic exploration are responsibly expanded without harm to our world".

Our vision is deeply rooted in the Polarcus core values of responsibility, innovation and excellence. These values are embedded throughout our organization and communicated to our customers, suppliers, and stakeholders alike.

These core values of responsibility, innovation, and excellence are reflected in the sixteen Polarcus Commitments (or policy statements) that can be grouped under the following headings:

A. Environmental sustainability.
B. Health, safety and security, and quality, and
C. Ethics in business and respect and promotion of human rights.

To ensure compliance with our commitments we have developed procedures and manuals which provide the necessary reference, standards, and instructions for responsibility and accountability in performing daily tasks.

In further support of our commitments, we introduced the Polarcus Principles in 2014. These principles identify and provide mitigation measures for areas of elevated risk to our people, the environment, our property, our reputation, and the security of our operations.

16
Polarcus Commitments

In order to ensure a well-functioning, integrated operation, all of these tools are included in the Polarcus management system which is accessible throughout every level of our organization.

This report presents how we have complied with our commitments in 2014. The complete set of the Polarcus Commitments can be found on our company website.

A. Environmental Sustainability

Commitment to the Environment

Certifications and procedures

In order to uphold our Commitment to the Environment, we have obtained (and maintain) certification against ISO14001:2004 through the leading classification society DNV GL. To obtain such certification, thorough environmental procedures, processes, and practices have been implemented. These are detailed in company manuals and located in our Management System.

1,183
Internal and external audits in 2014

DNV GL performs annual audits of our vessels and office in order for us to maintain the ISO14001:2004 certification. The last office audit was carried out in June 2014 for:

- Document of Compliance – ISM Code (Bahamas)
- Document of Compliance – ISM Code (Turkey)
- ISO 9001:2008 – Quality Management
- ISO 14001:2004 – Environmental Management
- OHSAS 18001:2007 – Occupational Health and Safety Management.

DNV GL vessel audits were also conducted during 2014 with the following audit focus:

- International Safety Management – Document of Compliance ("ISM")
- International Ships and Port Security ("ISPS")
- ISO9001:2008, ISO14001:2004
- OHSAS 18001:2007 and Maritime Labor Convention ("MLC") 2006.

All findings have been appropriately addressed and all vessel certifications were maintained in 2014.

DNV GL Triple-E™ certification

As an industry pioneer in environmental responsibility, we have elected to participate in the DNV GL Environment, Energy, and Efficiency ("Triple-E™") voluntary rating initiative. Triple-E™ is a mechanism for ships to be certified based on quantifiable verification of their environmental performance. It also serves as a tool to help ship owners and operators benchmark and improve environmental performance. It is comprised of four levels, from level 4 to level 1, with level 1 being the highest. The key elements of the Triple-E™ rating initiative are:

- Energy efficient ship design
- Environmental management system
- Onboard energy efficiency management
- Supported IMO initiatives for pollution control
- Verifiable measuring, monitoring and reporting

At the close of 2014, with the exception of Polarcus Nadia, the entire Polarcus fleet had obtained Level 1 Triple-E™ and we continued to be the only ship owner in the world to have ahcieved this.

DNV GL Triple-E™

Polarcus Fleet Triple-E™ rating	
Polarcus Adira	1
Polarcus Alima	1
Polarcus Amani	1
Polarcus Asima	1
Polarcus Naila	1
Polarcus Nadia	2*

* Polarcus Nadia presently lacking BWM-T
(Ballast water treatment system)

Triple-E™ levels

The Polarcus Fleet:

The ONLY Triple-E™ rated vessels in the seismic industry.
The ONLY Triple-E™ level 1 vessels in the world.

Responsibly measuring, monitoring, and reporting our emissions

In support of our vision, we have received a DNV GL emissions qualification statement. The DNV GL statement certifies the methodology and accuracy of our vessel airborne emission measurements. This verifies our ability to model the predicted exhaust emissions footprint for any project, then perform post-project analysis and reporting against the actual emissions measurements. For each project, an Emissions Certificate is produced and made available to our clients for their use in scope 3 Green House Gas ("GHG") emissions reporting.

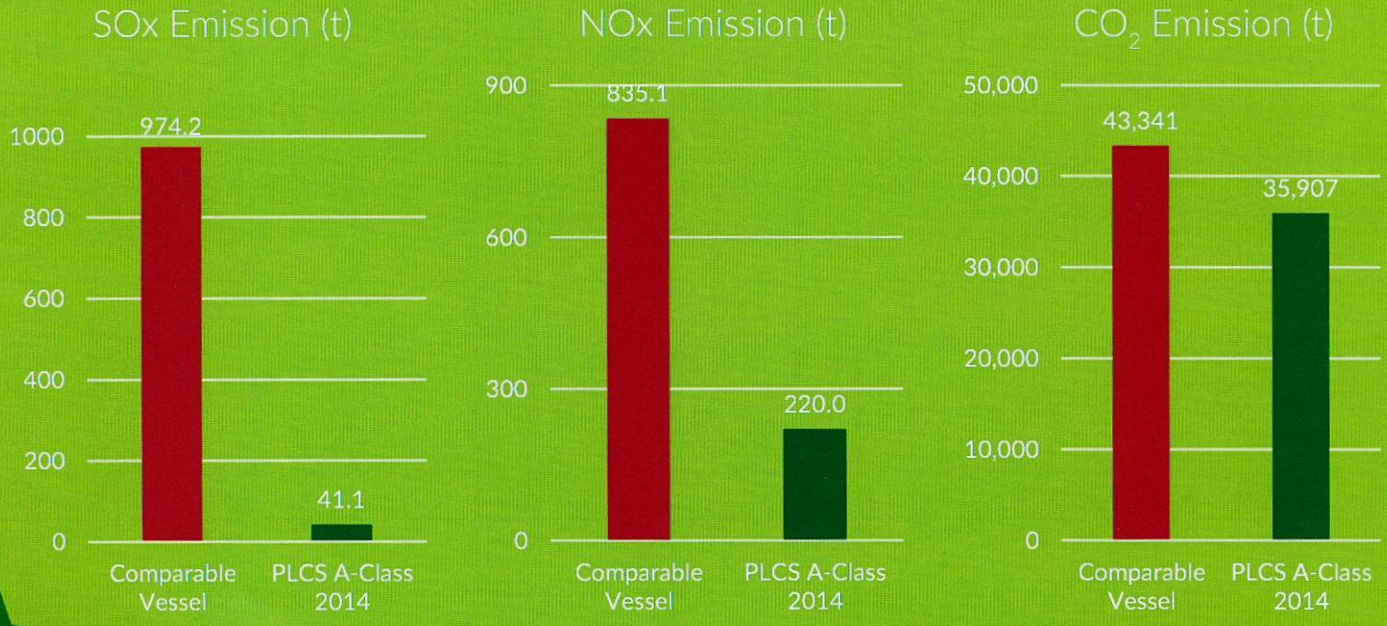
10%
reduction in CO_2 emissions

Our unique certification enables accurate emission statistics for our seismic fleet.

Fleet emissions per km²	2011	2012	2013	2014*
CO_2 Emission (t)	3.36	2.42	2.53	2.89
NO_x Emission (t)	0.022	0.018	0.018	0.021
SO_x Emission (t)	0.002	0.002	0.002	0.004

*In 2014, our total emissions of CO_2, NO_x and SO_x were lower than 2013, but record higher in this table on account of less square kilometers being acquired in 2014 verses the prior year.

Annual Emissions Comparison



(comparable vessel using HFO)

EMISSIONS CERTIFICATE

POLARCUS AMANI

Client:	PLCS MC/ Providence Resources	Start Date:	28Jun2014
Country:	Ireland	End Date:	22Sep2014
Region:	Europe, Africa, Middle East	Survey Size:	4,929
Streamer Config:	10 x 150 x 8100	Survey Duration:	81.1

Emissions Totals		Emissions per sq.km	
Raw NOx Emitted (t)	97.65	NOx Emitted (kg/sq.km)	11.82
NOx Reduction (t)	39.40	SOx Emitted (kg/sq.km)	0.68
Actual NOx Emitted (t)	58.25	CO2 Emitted (t/sq.km)	1.82
Actual NOx Emitted (g/kWh)	4.45		
SOx Emitted (t)	3.35	Vessel Consumption	
SOx % Reduction vs. IMO ECA	94	Fuel (MT)	2,815
SOx % Reduction vs. Non IMO ECA	98	Urea (t)	58
CO2 Emitted (t)	8,966		
		EEOI Seismic Acquisition	
		EEOI Target	6.43
		EEOI Value	2.04

Vessel manager

Polarcus®

Reducing our emissions to air through innovation

To minimize and reduce our environmental footprint, all of our Polarcus vessels have been equipped with emissions reducing or eliminating technologies. This includes selective catalytic reduction ("SCR") systems which reduce harmful exhaust emissions. Additionally, advanced ballast and bilge water management systems have been installed to mitigate the risk of any potentially harmful emissions to the sea.

The SCR technology installed and operated on all Polarcus vessels reduced our fleet-wide Nitrogen Oxides ("NOx") emissions by 40% in 2014.

40%

Nitrogen Oxides emissions **eliminated**

The Polarcus fleet utilizes low sulfur marine gas oil ("MGO") which minimizes sulfur emissions. In 2014, the Polarcus global fleet's average sulfur content of our fuel consumed was 0.10% sulfur by mass. This represents 35-times lower sulfur content than current global regulation permits.

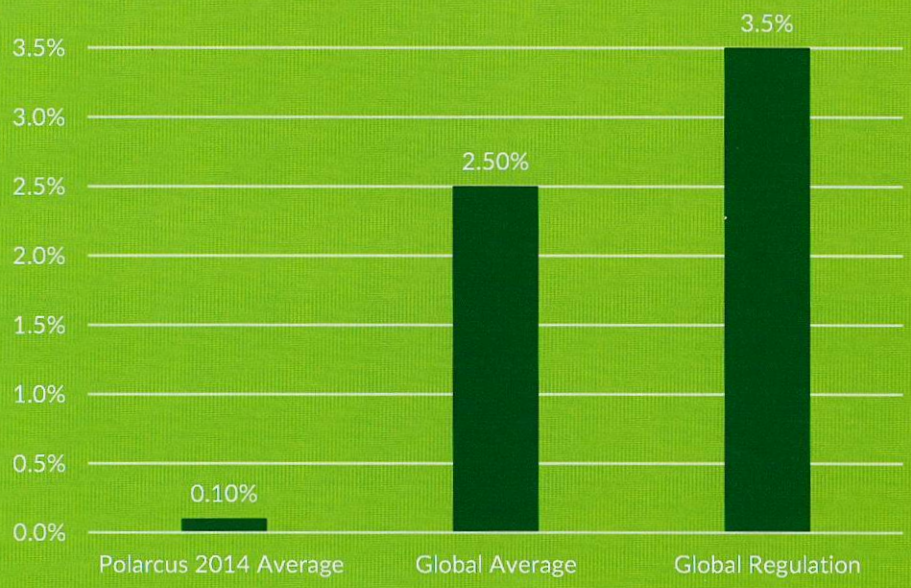
By voluntarily practicing the use of low sulfur MGO, along with consciously deciding to include SCR and bilge and ballast water technology in our vessels, the Polarcus seismic fleet was designed and built to meet the DNV GL Clean-Design ("Class") notation. This notion stipulates the requirements for controlling operational emissions and discharges.

26%

reduction in Sulfur Oxides emissions YoY

It is widely accepted that by adopting the Clean-Design notation, a ship owner clearly demonstrates that they have acted responsibly to limit emissions, and both operational and accidental pollution by taking the appropriate proactive steps, including a double hull design.

Sulfur Content in Fuel (by weight)



To supplement the Triple-E™ certification and in accordance with IMO requirements, a Ship Energy Efficient Management Plan ("SEEMP") has been implemented for all of our vessels. The SEEMP is an initiative targeted at reducing fuel consumption, and in turn, CO_2 emissions. Some of the specific initiatives within our SEEMPs include weather routing to improve transit efficiency, propeller performance to optimize propulsion efficiency, engine and compressor utilization to improve energy efficiency, and in-water seismic equipment drag reduction to improve operational efficiency. To measure the effectiveness of the SEEMP in reducing CO_2 emissions, Energy Efficiency Operational Indicators ("EEOI"), were put in place. These include:

- Seismic acquisition EEOIs which specify, over any production period, the total CO_2 emissions for each square kilometer of data acquired.
- Vessel transit EEOIs which specify, over any transit period, the total CO_2 emissions for each kilometer of transit.

0
recordable spills

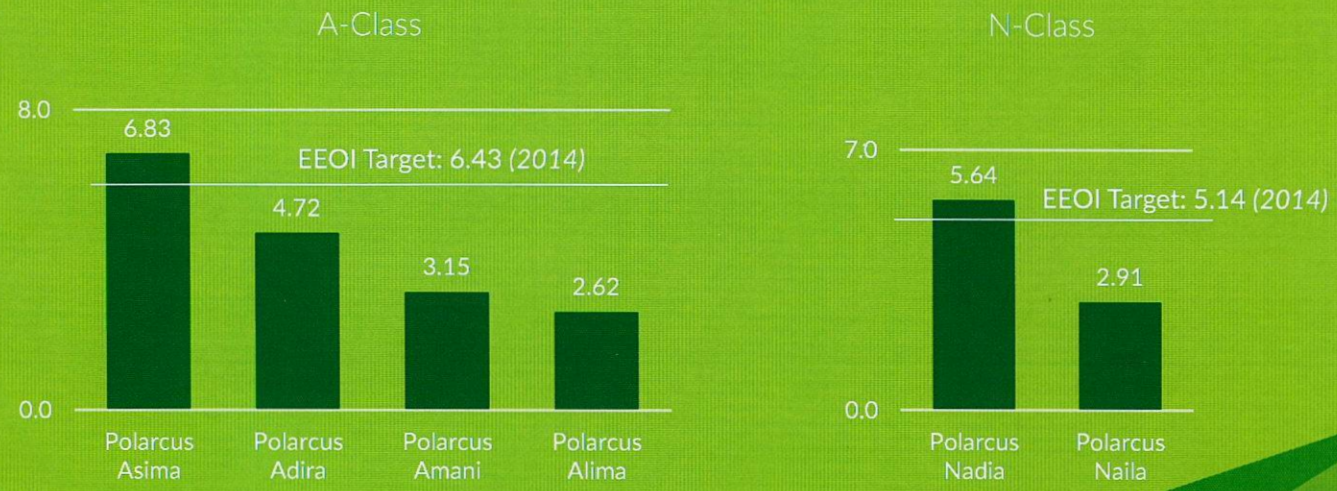
The initial Polarcus EEOI target values were established in 2012 and were based on the average 2011 performance for each of our vessel types (A-Class and N-Class). Each subsequent year the target values are decreased by 5%, tightening the environmental performance metric related to CO_2 emissions.

Reducing our emissions to water through innovation

Polarcus was the first seismic company to hold the DNV GL BWM-T class notation. Six of the seven Polarcus vessels operate a ballast water management system which is chemical free, posing no threat for introducing harmful foreign ballast water to local ecosystems. Polarcus Nadia does not yet have a BWM-T compliant ballast water management system installed.

All Polarcus vessels are using environmental friendly oils and lubricants, including all open deck hydraulic systems. This significantly reduces the impact of any potential spill to sea in the event of a system failure or difficulty. Polarcus has zero recordable spills in 2014.

EEOI Seismic Acquisition (CO_2 /km²)



Green Protection Team ("GPT")

In order to support the implementation of EHSQ initiatives and provide an open forum for discussion, we have established GPTs on each of our vessels and in our headquarters in Dubai. The teams are comprised of volunteer employees with meetings onshore chaired by members of our EHSQ management team, and offshore by the environmental officer on the vessel. Given the different worksite environments, some variation does exist between the scope of activities between the onshore and offshore GPTs. The common activities include:

98

GPT meetings were held in 2014

- Reviewing statistics, trends and indicators.
- Reviewing the Remedial Action Plans and Key Performance Indicators ("KPI"s).
- Monitoring the performance of emissions, waste handling and recycling.
- Providing assistance in risk analysis, hazard identification, and incident investigations.
- Evaluating and recommending environmental, health, safety and quality awareness/ improvement initiatives proposed by employees, suppliers, or clients.

In 2014, 98 GPT meetings were held world wide. The main initiatives implemented by our office GPTs were:

- Conducting an office air quality improvement campaign; cleaning of ventilation ducts.
- Introducing the GPT blog on the Polarcus intranet site.
- Raising awareness of low energy light bulbs.
- Running a poster campaign to promote healthy lifestyle.
- Promoting recycling at home and in the office.

The top initiatives put forward by the vessel GPTs in 2014 were:

- Implementing water conservation measures onboard
- Recycling all books to the seaman's mission.
- Introducting an ethylene removing system in food stores, to increase the shelf-life of fresh food.
- Introducing water flow reducers and water saving shower heads.

Client environmental feedback

Following each of our projects, we solicit feedback from our clients. The feedback questionnaire covers many facets of a successful project, including environmental, health, safety and security performance, operational and management performance, efficiency and quality of service. Of the responses received, our clients have been very supportive of our environmental agenda and this is reflected in the high scores in relation to our environmental performance during their projects.

B. Health, Safety and Security, and Quality

Commitments to health, safety and security

The Polarcus principles for health and safety are embodied in several commitments which relate to everyone involved in our business and are applicable both in and outside the workplace. These are the:

- Commitment for health and safety
- Commitment to quality
- Commitment to safe driving
- Commitment to a drug and alcohol free workplace
- Commitment to a smoke free environment
- Commitment to have a violence free workplace
- Commitment to a workers right to refuse unsafe work

Certifications

In order to address our commitment to health and safety along with the other associated commitments referred to above, Polarcus has obtained the certification OHSAS 18001:2007, Occupational Health and Safety Assessment Series, through DNV GL. This certification was gained by implementing a health and safety management system that includes all relevant procedures and practices of Polarcus. As with the other certifications, in order to maintain the certified standard, annual audits are performed by DNV GL.

Our people

Monitoring security, safety, and health conditions throughout our areas of operation (or potential operations) is the key to protecting the well-being of our people and mitigating risk. With approximately 30% of our acquisition projects undertaken offshore Sub-Saharan West Africa countries, monitoring the Ebola outbreak of 2014 was no exception. In response to the outbreak and our ongoing operations in the region, we implemented an Ebola awareness campaign providing the latest information on the virus and its prevention. As part of the campaign, we contacted our six employees resident in the region to ensure their awareness. We also restricted travel to those countries identified by the World Health Organization as having significant occurrence of the virus. One project was performed offshore Sierra Leone, and as a preventative measure, all personnel movements and logistics were conducted through Senegal.

Every year Polarcus conducts an anonymous employee survey in order to better understand individual perception of issues important to our well being. In 2014, we continued to have a high response rate, with over 80% of all employees completing the survey.

On the question, "How safe is your workplace?", more than 80% of our field personnel responded that their work place is either "very safe" or "extremely safe". Similarily, more than 90% of our office staff feel that their workplace is "very safe" or "extremely safe". We feel strongly that our commitment to a worker's right to refuse unsafe work (more commonly referred to as the, "right to stop the job") plays a significant role in our people feeling safe at work.

The main leading indicators related to employee enjoyment of working for Polarcus include, the feeling of being valued by Polarcus, and the willingness to recommend Polarcus to a friend. With a positive, high response rate for each of these indicators received in 2014, the understanding that our employees feel highly engaged, are keen to provide recommendations for continual improvement, and are likely to remain with Polarcus is justified.

95%
of our people enjoy working for Polarcus

Our extremely low rate of employee turnover reflects that our people are happy, "Being Polarcus".

EHSQ improvement objectives

Annual EHSQ improvement objectives are set for the company, the fleet and for personnel. These are measured quarterly. The EHSQ improvement objectives apply to all levels of the company and include aspects relating to all Polarcus Commitments. The achievement of the 2014 EHSQ improvement objectives was assessed at 78% for the company as a whole, compared to 2013's result at 75%.

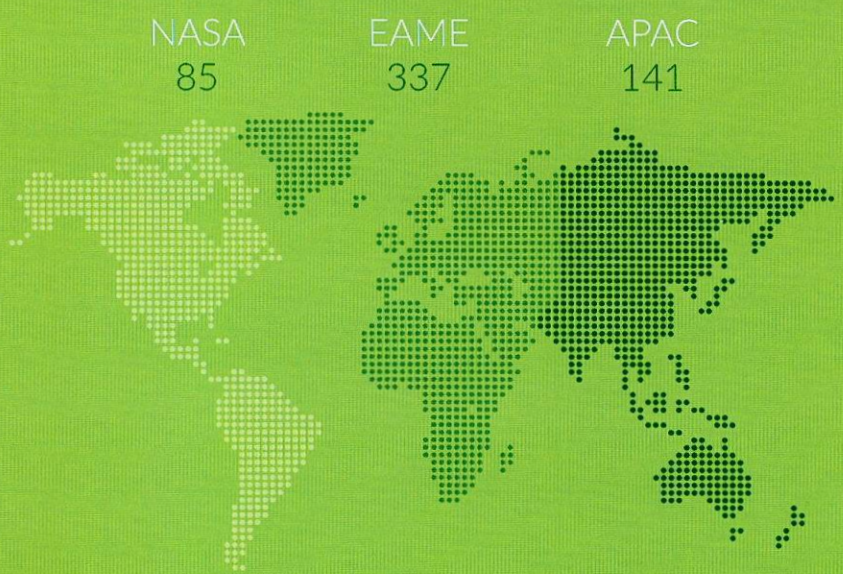
EHSQ reporting and initiatives

All incidents, injuries, near misses, non-conformances and improvement suggestions are recorded within the Polarcus EHSQ reporting system. Reports are rated according to the International Association of Oil and Gas Producer's ("IOGP") risk matrix in order to assess actual and potential risk based on realistic expectations. Subsequent to analysis of actual and/or potential risks, root cause investigations are performed. All reports are followed up by named responsible parties and actions identified within a set time frame. Following satisfactory completion of actions, the reports are then closed out. Throughout the process, notifications/alerts are communicated through the EHSQ reporting system to promote awareness, communicate findings, and best practice.

Total Polarcus Employee Exposure Hours 2014: 4,750,846

IAGC Report Categories:		Additional Categories:	
RWC	1	First Aid Cases	60
MTC	0	NCCAPA	13,532
LTI	1	Near Miss	204
LTIF	0.21	Improvement Suggestions	5,020
TRCF	0.42		

Who we are



563
Employees

53
Nationalities

10%
Female

Polarcus experienced two recordable incidents during 2014, which represents a 60% decrease from 2013. The recordable incidents related to one Lost Time Injury ("LTI") and one Restricted Work Case ("RWC").

The Lost Time Injury Frequency ("LTIF"), which relates to number of LTIs per million man hours, decreased from 0.63 in 2013 to 0.21 in 2014.

Total Recordable Case Frequency ("TRCF") which relates to number of recordable incidents per million man hours, decreased from 1.05 in 2013 to 0.42 in 2014.

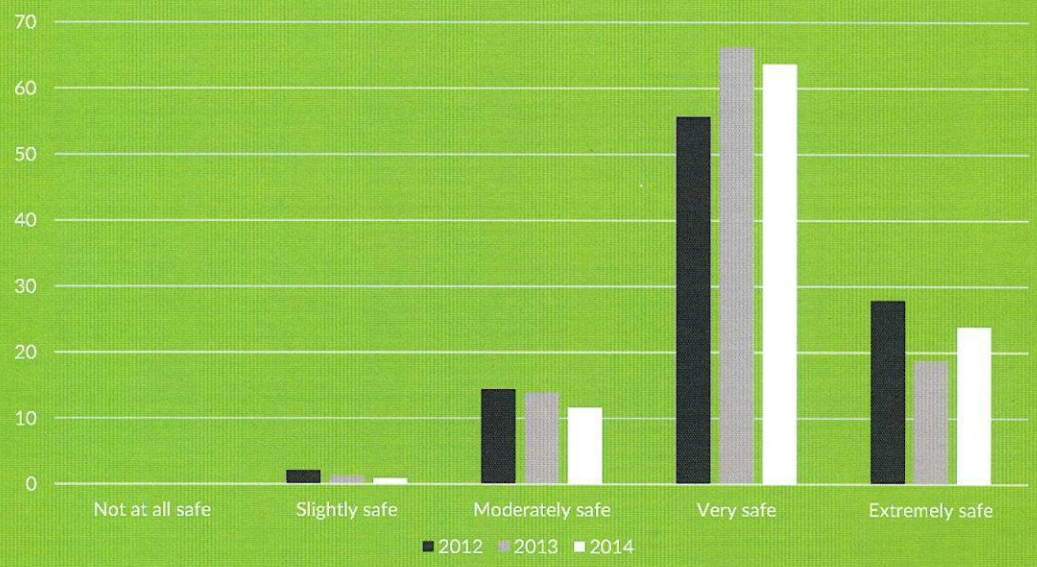
The number of First Aid Cases ("FAC") decreased from 73 in 2013 to 60 in 2014. In addition, the Near Miss ("NM") reporting decreased from 259 in 2013 to 204 in 2014.

Reporting numbers for Non-Conformance, Corrective Action, and Preventive Action reports ("NCCAPA") continues to occur at a high rate. With 13,535 reports submitted in 2014, this helps to confirm that reporting is now embedded as a culture within Polarcus and the Companies suppliers.

A proactive positive approach to employee and supplier involvement comes via the Polarcus, "Improvement Suggestion" reporting. Through this resource an employee can suggest a potential improvement relating to any aspect of the business. 5,020 improvement suggestions were logged in 2014.

What we think

How safe is your workspace?



Learning and development

The development of our employees is driven by legal requirements, industry standards (derived from organizations such as the International Association of Geophysical Contractors ("IAGC"), competency requirements of job roles, project requirements, and development plans produced for the individual employee during their annual performance appraisal.

Training is delivered through a combination of on-the-job experiences, e-learning, internal and external instructor-led sessions. The instructor-led training is supplemented by Polarcus field engineers who regularly visit the vessels and carry out coaching and awareness training.

In 2014, all field and office employees undertook various learning and development activities to enhance their knowledge and skills. We conducted six field trainee inductions for a total of forty-eight new field employees. This training is a blend of internal and external instructions to give practical information about work offshore. The purpose of this is to present the company culture and structure, to introduce trainees to the geophysical aspect of the work, and deliver essential offshore safety induction and emergency training. In addition to this, an individual vessel induction is conducted when an employee first joins and a job familiarization process is also provided.

497
training courses offered in 2014

361
EHSQ-related training sessions in 2014

Three hundred and sixty-one EHSQ related training sessions were held in 2014, attended by four hundred and ninety-seven employees in total. This figure does not include emergency drills carried out onboard the vessels which also constitute as a training element.

In addition to the regulatory and industry standard training, Polarcus offers additional training programs in order to promote health and safety to educate our employees, suppliers and any other persons engaged in work on a Polarcus worksite. Two department chief and field manager meetings were held in Dubai to review environmental, health and safety elements of Polarcus operations and to update field supervisory staff on various company initiatives.

Polarcus provides a library of company-specific awareness modules available to all of our employees for individual training sessions or as a topic of discussion for general safety meetings. General safety meetings are held monthly onboard the vessels. The topics of these meetings range from safe systems of work, environmental awareness, health and general wellness and endemic disease and preventions.

Four general safety meetings were held at the Polarcus office in Dubai throughout 2014. The main topics covered were travel safety and security, infectious diseases and driving safety.

To strengthen Polarcus EHSQ performance, the Company has engaged with an external company to deliver an initiative titled "EHSQ for Managers – Uncompromised Safety". This four day course helps participants understand the concept of a management system, how to proactively identify and mitigate risks, and how to develop the leadership behaviors needed to embed a focus on safety. In 2014, two workshops were held, and the initiative will continue into 2015.

In early 2014, Polarcus introduced the Polarcus Principles in support of our commitments and our core values. These twelve principles identify and provide mitigation measures for areas of elevated risk to our people, the environment, our property, our reputation and the security of our operations. The Principles have been well received by our personnel, suppliers and our clients. They are non-negotiable and if found to be in wilfull disregard, it is understood that whomever does so is choosing not to work for Polarcus.

In Q3, Polarcus introduced an EHSQ Short program. This program comprises a comprehensive library of brief EHSQ presentation material designed to support our principles and commitments.

Throughout 2014, the Polarcus EHSQ Department continued with the "Focus on Safety" program. Originating in 2012, the "Focus on Safety" program is a quarterly campaign targeting a specific aspect of health and safety which was initiated to raise awareness levels and help instill a stronger Polarcus EHSQ culture. The focus on safety quarterly topics in 2014 were:

- Polarcus Principles in Q1
- Permit to Work and Lock Out / Tag Out in Q2
- Pre-Planning in Q3
- Crane Safety in Q4

The commitment to safe driving is supported by a training course in defensive driving and safe driving practices. For new field recruits, the induction program includes a session on safe driving as well as a practical session on a "seatbelt convincer".

Screening

Polarcus introduced a substance abuse screening program in 2010. This supports our documented procedures aligned to the Commitment to a drug and alcohol free workplace. In 2014, 359 employees (353 field and 6 office employees) were screened. Presentations of the company's drug and alcohol commitment have been made across the company, both onshore and onboard the vessels, during project start-up meetings, port calls and on management visits to the vessels. A small proportion of the screened individuals had results confirming the presence of substances being tested for: the vast majority of these were due to the normal use of approved medications. For the very small remaining number of non-negative results, disciplinary action was taken.

Security

The commitment to security is upheld via the use of the company's risk management processes, including security hazard identification and security risk assessments prior to and during the execution of all seismic projects. International Ship and Port Facility Security ("ISPS") regulations require the company to continuously evaluate risks and implement appropriate measures to mitigate against them. The ISPS certification is maintained via annual audits carried out by DNV GL.

In order to best monitor the security aspect of various operations on the vessels, along with travelling employees, Polarcus continuously monitors risk levels around the globe. Potentially the relevant risks can stem from piracy, terrorism, organized crime, or even the threat of environmental activists attempting to disrupt the business. Polarcus maintains a strong grasp on the health, safety and security issues affecting any regions in which the company is engaged or have plans to pursue business opportunities.

For every project, a security risk assessment is carried out. Additional information is gathered depending on location of proposed projects and perceived security risk.

Client health, safety and security feedback

Throughout the year our client feedback has been constructive and positive in relation to our health, safety, and security. In particular, we have received very possitive feedback regarding the introduction of our Polarcus Principles and our proactive approach to looking after the wellbeing of our people and suppliers.

C. Ethics in Business and Respect and Promotion of Human Rights

Commitments to ethics and human rights

Many of the Polarcus Commitments reflect the principles of an ethical business model.

Our commitment to ethics has a strong focus on risk management which is set out in the commitment to managing risk. We also maintain a commitment to an open door style of management, and the commitment to avoiding conflicts of interest. Polarcus also has a commitment against corruption and unlawful commercial practice. These commitments are further supported by the commitment for continual improvement and the commitment to human rights.

Procedures and initiatives

A whistleblowing procedure was developed and implemented by the company in 2012 to support the commitment to an open door style of management. The key focus of this procedure is that Polarcus employees must feel comfortable reporting any concern, fact or circumstance suggesting a past or ongoing violation of any of the Polarcus Commitments, manuals or procedures. Employees shall have the full backing of management should they wish to identify and discuss any work-related concerns or any risks or violations they have come across in the performance of their duties, without any fear of retribution. Concerns may be raised directly with the employee's supervisor or with executive management, but the possibility also exists of making a declaration via email to an email address created for these purposes. Such communication may be made on an anonymous basis which provides a confidential reporting channel for Polarcus' employees. Regardless of the manner in which a report is made, Polarcus will investigate and if appropriate take remedial and/or disciplinary actions against those who have acted improperly. Retaliation for reporting actual or suspended misconduct is not be tolerated.

There was one instance in 2014 where our whistleblowing procedure was invoked by an employee. Following an investigation it was determined by the parties involved that the root cause was a misunderstanding of the procedure and that the incident itself was addressable at local management level. The event did demonstrate however the effectiveness of the procedure.

In order to support the commitment against corruption and unlawful commercial practice, Polarcus maintains an anti-corruption manual which sets out a detailed anti-corruption procedure and training relating to contractual arrangements, facilitating payments, gifts and entertainment. This procedure is designed to ensure anti-corruption laws (including the UK Bribery Act 2010) are duly complied with, not only by our employees, but also (to the extent practicable) by all of our business partners. During the second half of 2014 we provided our anti-corruption manual to a third party consultant for revision of both the procedure and

training module. This process was underway through the end of 2014. In our global operations, we view facilitating payments as one of our highest exposures in terms of business ethics, particularly when our vessels move in and out of shipping ports. To mitigate this risk, we provide training and support for our vessel captains, our shore representatives, and our suppliers. Additionally, we discuss our position with local logistics agents in advance of our vessel arrival into port.

In 2014, one of our suppliers was involved in a facilitated payment incident in South America whereby cigarettes were given to local port authorities in order to expedite outward clearance formalities for a support vessel. Also in 2014, one of our vessel Captains was involved in a similar incident whereby cigarettes were given to local port authorities in West Africa to expedite a clearance process. In both incidents, appropriate disciplinary action was taken by Polarcus. The incidents were discussed during internal fleet-wide teleconferences and with our suppliers.

During 2014, an incident of employee misconduct in relation to business expenses was discovered. A detailed investigation ensued that revealed a breach of our commitment, and appropriate disciplinary measures were administered, including dismissal of the concerned employee.

Polarcus support to local development

Our business activities are global and through these we have a significant impact on many local communities in which we operate. This impact includes not only economic support and development through the procurement of local goods and services, but also the enhancement of skills, knowledge and experience of the many people employed by our local partners and suppliers.

Our policy of recruiting from the global talent pool has resulted in an employee base that is resident in more than fifty countries around the world. Polarcus invests heavily in learning and development initiatives for our employees, therefore making a direct, positive impact on skills enhancement within each of these countries.

Polarcus employs over one hundred staff in its administrative head office based in Dubai, United Arab Emirates and each year we implement a variety of initiatives to support the local community. Initiatives supported in 2014 include:

- Donations of food, clothing and funds raised from personal employee donations to victims of the 2013 Haiyan Typhoon disaster in the Philippines. In addition, many of the vessel crews also made personal donations to the victims of this disaster.
- In support of an orphanage in Murmansk, Russia, crew members of Polarcus Nadia made a charitable donation which was used to purchase winter clothing for the children.
- Promoting environmental initiatives including water & energy conservation.
- Raising local cultural awareness within our employees and their family dependants through visiting the Sheikh Mohammed Centre for Cultural Understanding
- Running various employee well being initiatives to encourage healthy lifestyles and the participation in several charities events. These included donating funds or resources raised by employees to local charities.

Being Polarcus

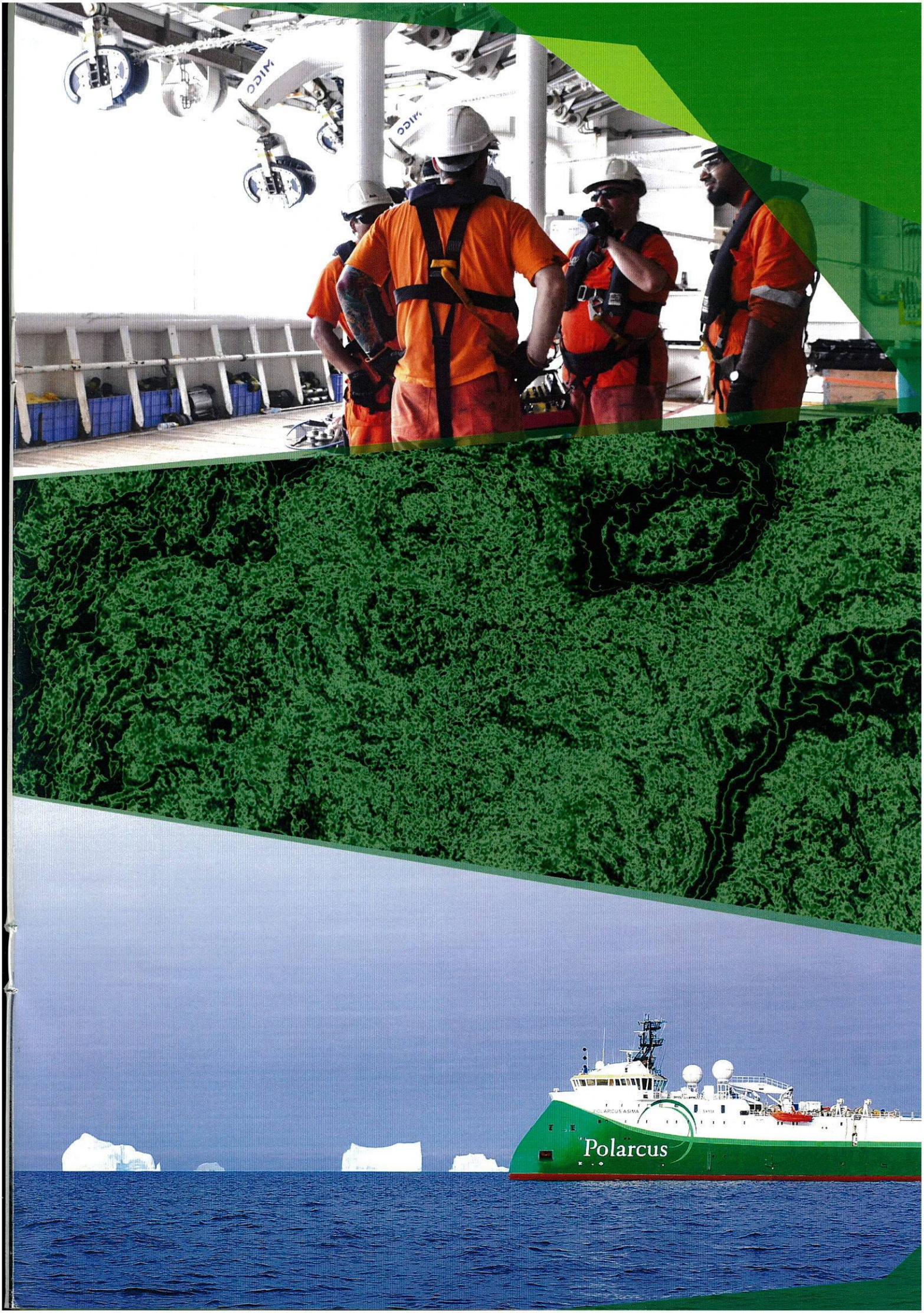
From the very beginning we set out to be the most environmentally responsible geophysical services provider. Today we have the youngest, most uniform, and greenest fleet of seismic vessels together with a proven global track record of responsible geophysical excellence.

Along the way, our vision, values and commitments have not only guided us, they have formed the fabric of our Polarcus culture. At Polarcus, we not only have written doctrine, we have belief. We believe that by Being Polarcus, staying true to our values, our commitments, each other, and to our shareholders, we can turn vision into reality as we continue to set precedent for environmental stewardship and challenge others in industry to elevate their own.

We are committed to demonstrating a systematic management approach towards Corporate Social Responsibility in our business decisions, and throughout our geophysical operations. We strive to exceed expectations in the fundamentals of environmental sustainability, health, safety and security, ethics in business and the respect of human rights.

In doing so, we are well aware that we are held directly accountable for all of our actions, from the ethical behavior of each one of us our supply chain activities, to our impact on global communities and those at home.

The vast majority of our employees enjoy working at Polarcus, (95% in 2014) and being part of the Polarcus family. Our commitments, our values, our principles are all part of our culture, of Being Polarcus.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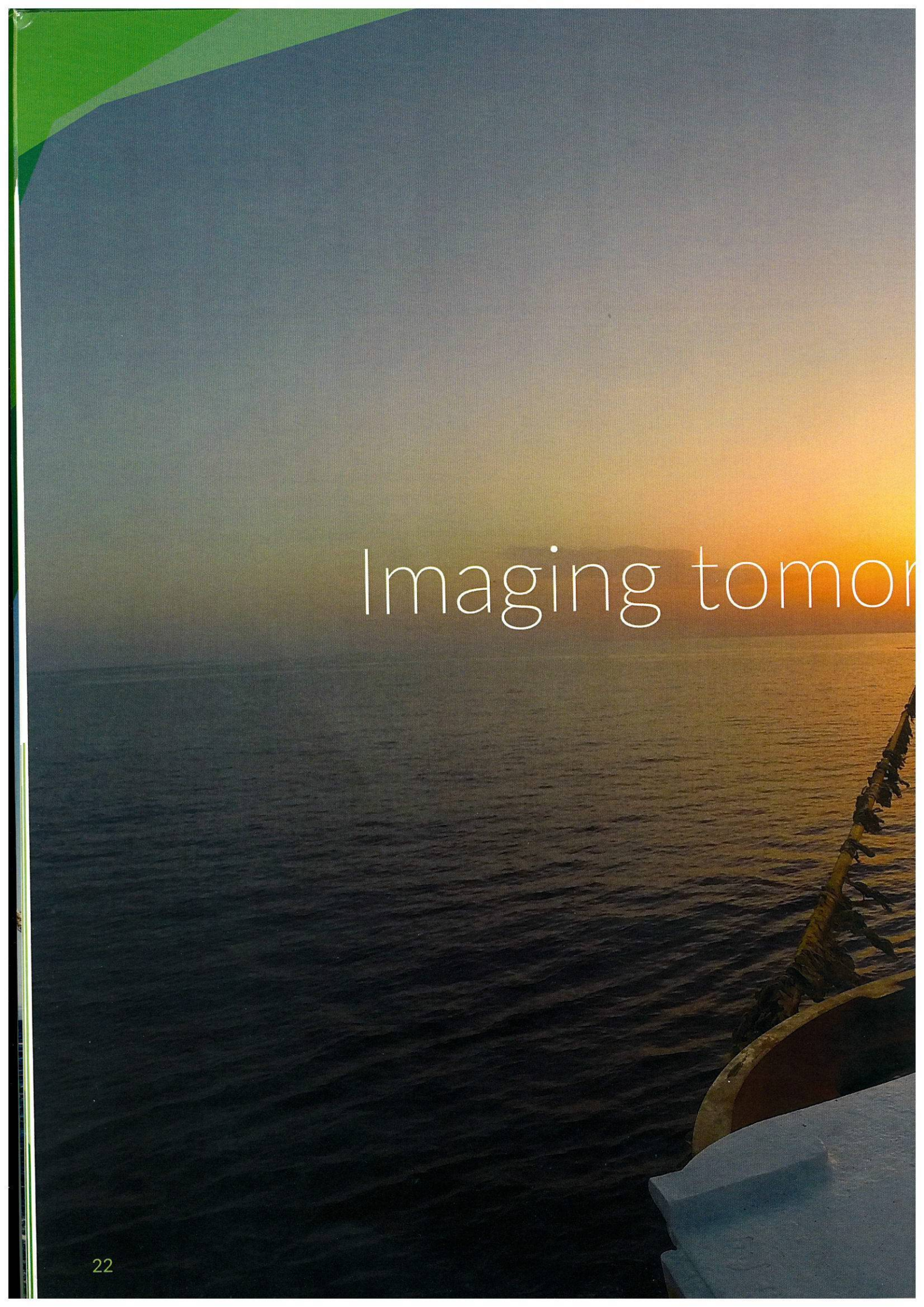
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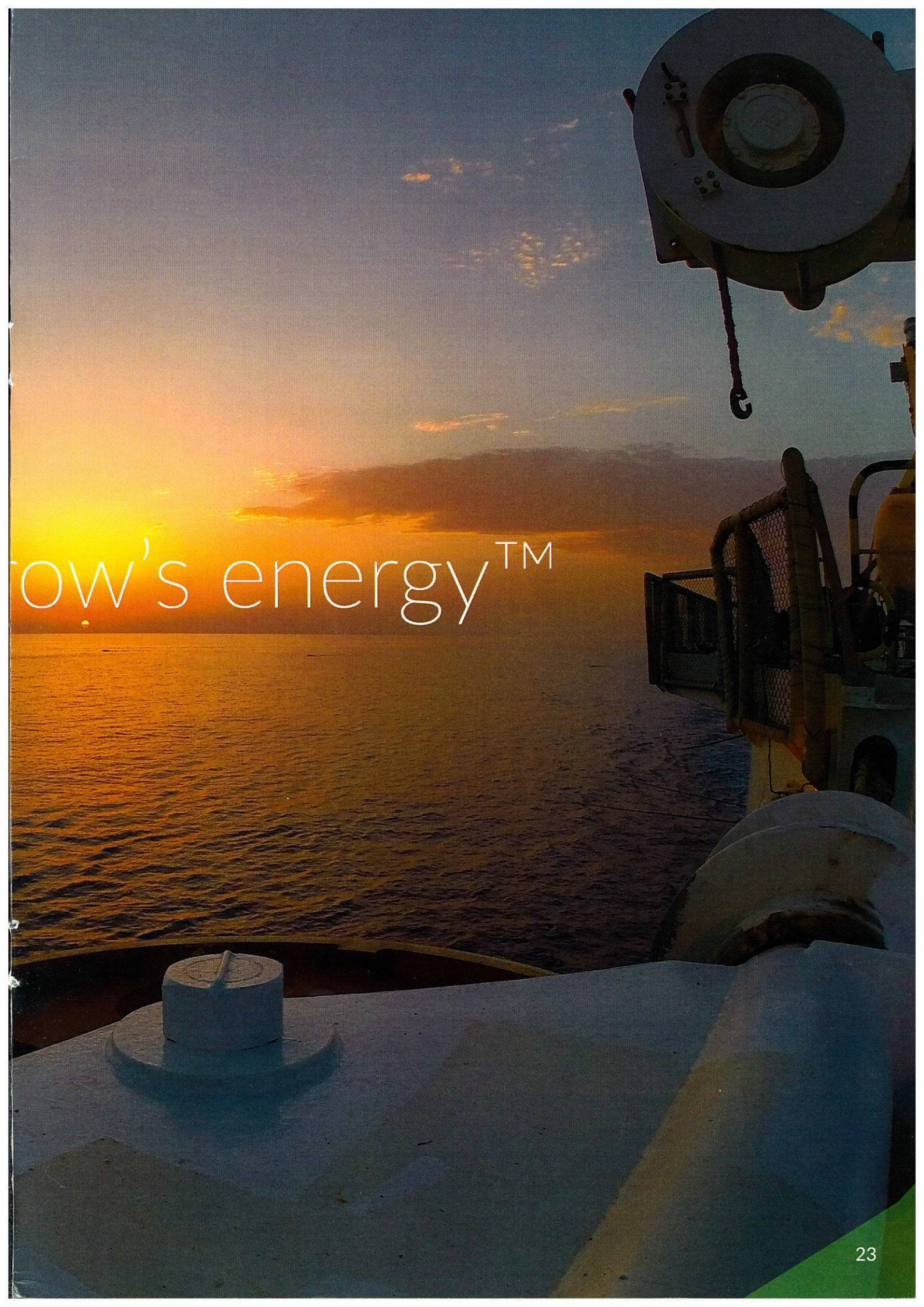
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