

JADE – A Universal Tool for Consistent Jointing Performance and Data Recording Throughout the Submarine Cable Industry?

Jointing
Automated
Document
Environment

Abstract

Global Marine has introduced JADE internally, to record the progress of each joint through its various sub-operations, thus capturing more accurate and consistent information than it is generally possible to do on a manual basis. The use of JADE drives jointing consistency across all jointing teams. In a world of more reliable systems and less frequent need for jointing repair, JADE keeps skills sharp, and times fast without sacrificing quality. The envisioned presentation will provide a description of how JADE works, the impact it has had on improving internal controls and the possible benefits to cable owners were it (or something similar) to be adopted across our industry.

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INTRODUCTION

Before we examine the benefits of JADE to Global Marine in particular and the submarine cable industry in general, it is important to look at the reasons for its development and then how it works.



The UJCM (& UQJCM) is the Industry Standard & is irreplaceable for its wealth of technical content, but it is large and complex and like an encyclopaedia, information takes time to find. Twenty years ago and with only three UJ cable manufacturers, the manual was easy to navigate. Today, there are in the region of thirty five cable types, each with several variants, adding up to over seven hundred qualified cable combinations. Much of the content of the UJCM is written, though the amount of illustrations and pictures is steadily increasing, but nevertheless, with so many sections, kits and subtle variations in cable design, negotiating the UJCM is becoming a skilled task in its own right and can take time! With such a complex manual, there are the possibilities of errors occurring. Cable jointers prefer to work from illustrations or pictures with a summary of key information such as dimensions, pressures and piece part numbers. White boards have been used for this purpose but this can lead to errors as key information can change and the white board may not get updated. In an industry that is competitive with both cable repair times and accuracy, it is essential for vessels to have access to the correct jointing information with the least amount of delay and as soon as it is available.

In parallel with the technical aspect of jointing is the recording and analysis of jointing data, such as ferrule measurements and moulding inspection, times for the various stages, personnel involved, equipment type and calibration status and possible re-work information. The list seems endless and all this has to be recorded manually or in a number of discreet electronic files for future analysis both internally and by IPRS.

What was required was an all-embracing software application that would provide the latest technical information to our vessels, record all the relevant jointing data, record testing information and keep all interested parties (Cable Operations, Cable Officers, Captain & customers representatives) informed of the progress of the repair.

JADE was therefore developed to provide the contents of the UJCM/UQJCM in a mainly pictorial format that is easy to understand, quick to access and suitable for a wide skill-base, together with suitable facilities to record jointing data, produce

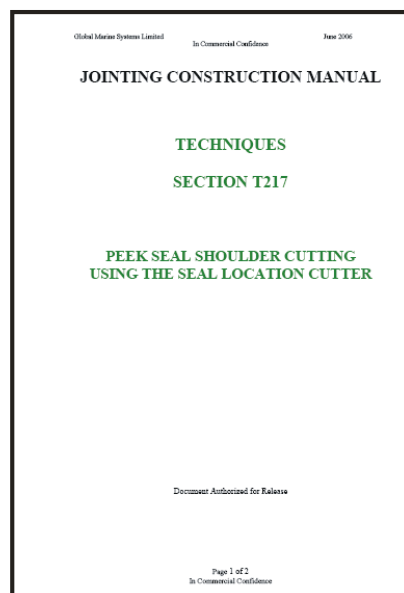
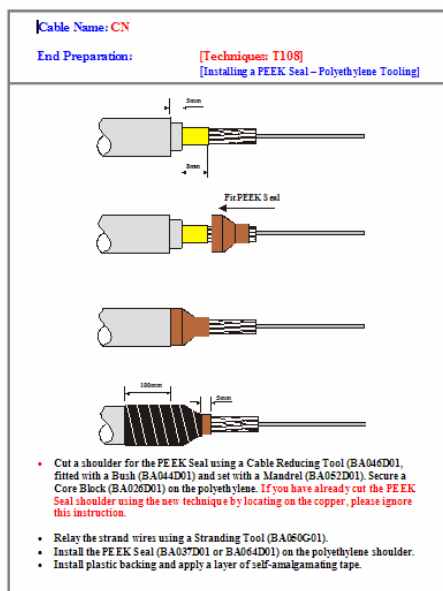
reports and provide supervisory information on jointing progress. Like all large software projects, JADE was developed in an iterative process. Prototype versions were tested in the Training School and at sea and the resultant feedback provided information for the next release. It was soon discovered that the more facilities that were provided, the more that were required. It was in this arena of shifting goalposts that the final specification for JADE was written and the resultant software produced.

WHAT DOCUMENTATION DOES JADE PRODUCE?

Addressing the technical content first, JADE produces three main items of documentation:

- Storyboards
- Techniques
- UJCM/UQJCMs

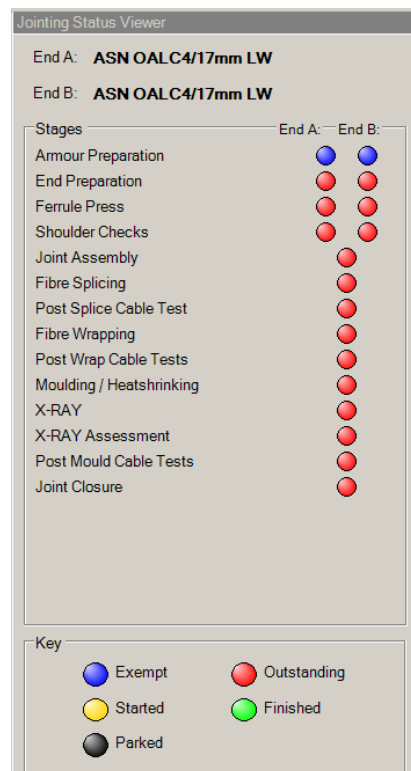
A Storyboard is a one-page WORD document describing a joint operation in a mainly pictorial format. There are many hundreds of these within JADE and when they are concatenated in a pre-determined order, they form a complete jointing manual for two cable types, from armour preparation to joint closure. The experienced jointer can work from the storyboards alone, as he only requires key information such as cut-back dimensions, piece-part numbers and pressures etc. He knows how to mould without referring to the lengthy UJCM034. He just needs information such as cable clamps & mould adapters.



Example of a Storyboard & a Technique

The less experienced jointer may be uncertain about a particular technique. In this case he will be able to access that technique from a drop-down menu without having to refer to the UJCM. The complete range of UJC & GMSL Bulletins is also available from a drop-down menu, as are the current copies of the UJCM if access to the source data is needed. So JADE is completely flexible for all levels of skill. When a jointer

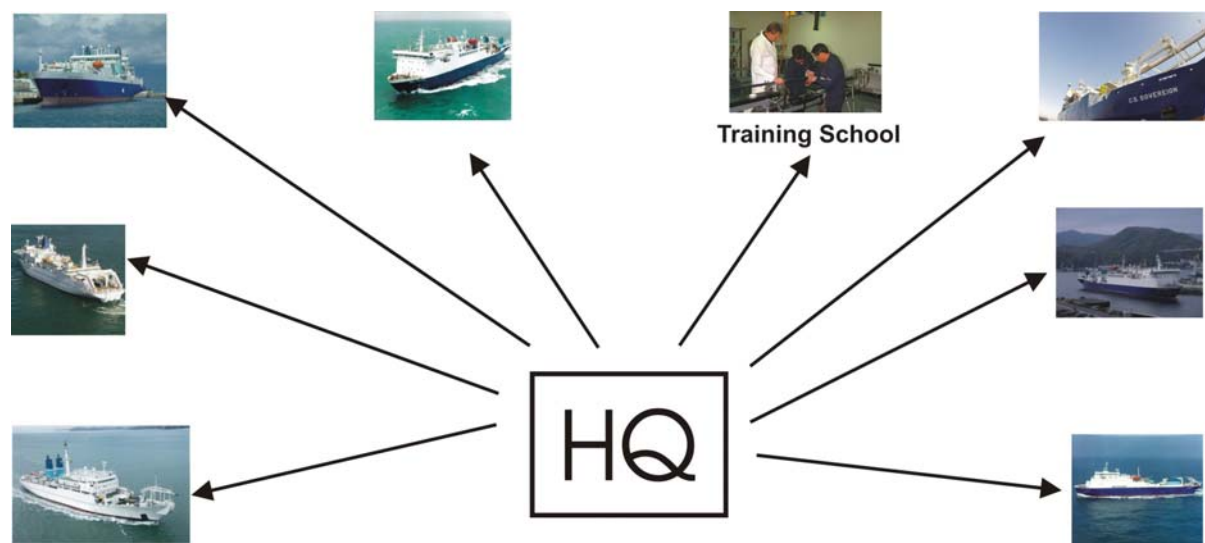
The cable officer, captain & customer's representative can monitor the progress of the joint from the bridge or cabin using the Jointing Status Viewer. This is beneficial to the captain who can plan the vessels operations; useful to the cable officer who can determine when he is required for testing without constant visits to the jointing area and useful to the representative for reporting aspects without interrupting the jointing operation. For obvious reasons, this is colloquially known as the 'traffic light system' as it provides a clear indication of the status of the jointing process. Blue indicates that the process is exempt, such as armouring during a lightweight joint, red indicates outstanding, yellow is in-progress, green is finished and black is parked. The 'parked' option is particularly useful when a joint is started on-passage. When the joint is parked, the time-clock is suspended until the jointing is resumed. JADE also has the option of starting the *Contractual Jointing Time* when required.



The Jointing Status Viewer

HOW DOES JADE WORK?

The master database for JADE is located at GMSL Headquarters. One person (with back-up) is nominated to make changes to the database, such as adding new cable types, changing storyboards or changing parameters etc. Each vessel has its own integral database which is updated from GMSL Headquarters by a proprietary email system, so all vessels are viewing and producing identical documentation. The same software is also used by the Training School and is updated at the same time as the vessels. Although JADE documentation is updated in synchronisation with the UJCM for conformance, if something crucial needs to be changed, such as a collet pressure, the JADE manuals on all vessels can be updated simultaneously without waiting three months for the next Explorer CD ROM.



JADE Updates and Database Information is transmitted to all vessels simultaneously

The best way to understand how JADE is used for a cable repair is to imagine a typical repair scenario. Cables ship Sovereign is repairing a cable in the North Sea that has suffered anchor damage. Stock cable is being jointed to the shore cable. The cable is ASN OALC4 SA, it is a powered system but does not have to be repaired under PGU conditions.

A JADE manual needs to be generated for the repair, so let's fill in the details on the opening JADE screen. The Cable Engineers and Jointers names are entered at this stage.

GMSL - Jade - Job Details

Boreham Training School **Global Marine**
Systems

Customer's Name: SUFFOLK CABLE COMPANY

Cable System: Felixstowe to Hamburg

Segment: A Fibre Count: 16

Brief Job Description: Repair of the Felixstowe to Hamburg system which was damaged 20km from Felixstowe by a container ship dragging its anchor across the cable.

Jointer Team

Number	Name	Jointer Type
1	K Coaten	Chief Cable Engineer
2	Russell Agapito	Jointer
3	Hamish Barr	Jointer

Resource Type: Jointer Name: Hamish Barr Add Remove

Proceed Exit

On the next screen we will select **UJ**, **Powered System** & **No PGU** for the main parameters:

Joint

Boreham Training School **Global Marine**
Systems

Joint Type: **UJ** (selected), UQJ

System Properties: **Powered System** (selected), UnPowered System

PGU Repair: Yes, **No** (selected)

Encapsulation: Moulded, Heatshrink

A-End Cable: [Empty field] ...

B-End Cable: [Empty field] ...

Common Kit: 09001, 09002

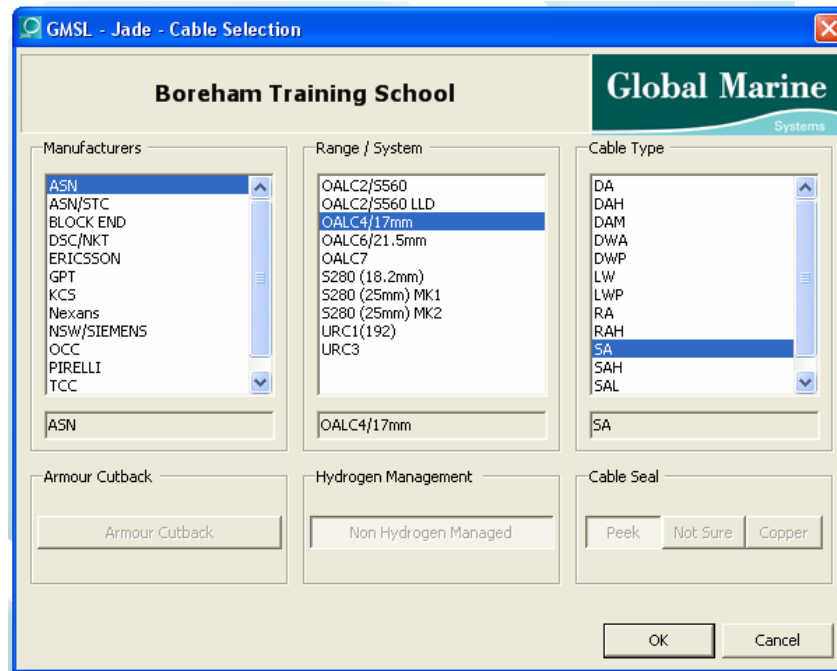
LW Protection Kit: 10011/10013, 10012

Screen Termination: Screen Earth, Screen Continuity

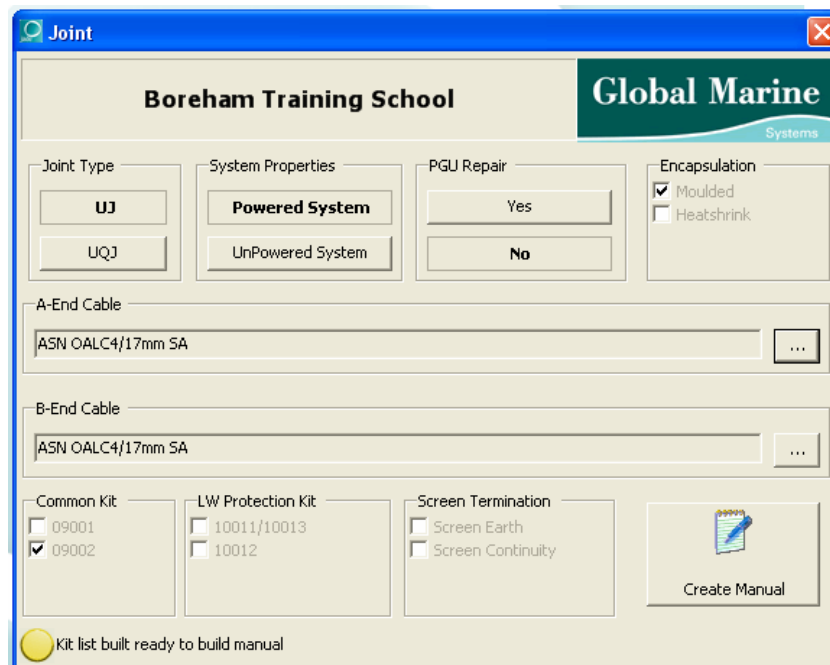
Create Manual

Select joint parameters.

We then select the A and B end cables from the displayed list:

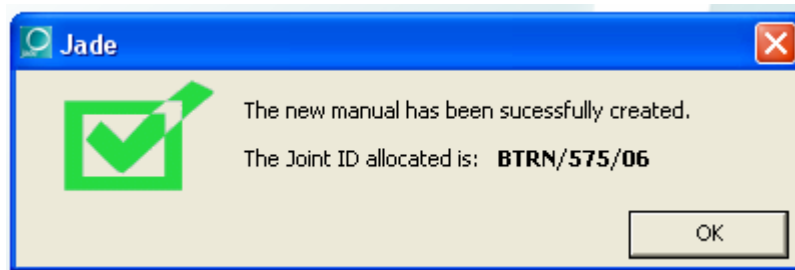


We have now selected what we require. You can also see tick boxes for Common Kit, LW Protection Kit & Screen Termination, but these are only active when appropriate. Now select the 'Create Manual' button:

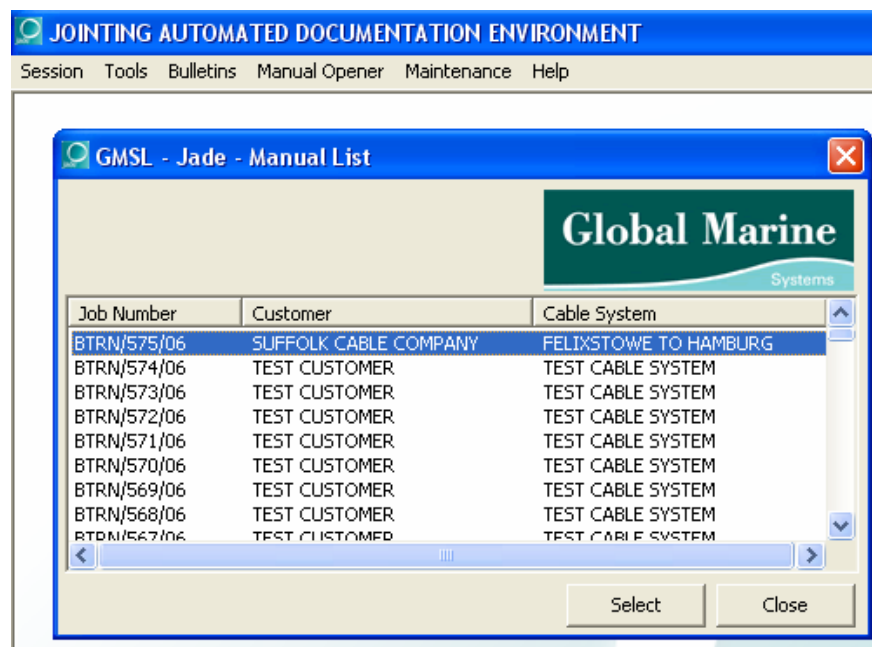


Now select the 'Create Manual' button:

The manual will take a few minutes to create. When it has been created, the Joint Identification will be displayed, in this case BTRN/575/06. The Prefix will be different for each vessel and the number will be incremental.




We now need to open our new and bespoke manual. On the Main Menu, select 'Manual Opener' and the list of manuals will be displayed. BTRN/575/06 is the top one. Select this manual:



You will then be prompted to enter the jointing kit serial numbers, whether the cables are stock or seaward etc and whether you want to set the Contractual Jointing Time.

We then open the bespoke manual which is only for this particular repair and only includes the two cables selected at the beginning. There are no choices of cables to make; all the relevant information is displayed in the manual. When the manual is opened, there are two screens displayed. The screen on the left contains the actual construction manual and the screen on the right is the Jointing Status Viewer which we discussed earlier.

 GLOBAL MARINE SYSTEMS LIMITED	
SYSTEM NAME	
FELIXSTOWE TO HAMBURG	
SEGMENT: A	
REPAIR OF THE FELIXSTOWE TO HAMBURG SYSTEM WHICH WAS DAMAGED 20KM FROM FELIXSTOWE BY A CONTAINER SHIP DRAGGING ITS ANCHOR ACROSS THE CABLE	
DOCUMENTATION FOR JOINTING	
ASN OALC4/17MM SA TO ASN OALC4/17MM SA	
BTRN/575/06	
JOINT TYPE	UNIVERSAL QUICK JOINT (UJ)
VESSEL / LOCATION:	BOREHAM TRAINING SCHOOL
CHIEF CABLE ENGINEER:	K COATEN
CABLE ENGINEER:	
JOINTER #1:	HAMISH BARR
JOINTER #2:	RUSSELL AGAPITO
JOINTER #3:	
JOINTER #4:	
CONSTRUCTED UNDER P.G.U CONDITIONS:	NO
LIMITATION ON QUALIFICATION:	
MANUAL CREATION DATE:	THURSDAY 12 OCT 2006
SUFFOLK CABLE COMPANY	

Joining Status Viewer		
End A: ASN OALC4/17mm SA		
End B: ASN OALC4/17mm SA		
Stages	End A:	End B:
Armour Preparation	●	●
End Preparation	●	●
Ferrule Press	●	●
Shoulder Checks	●	●
Joint Assembly	●	●
Fibre Splicing	●	●
Post Splice Cable Test	●	●
Fibre Wrapping	●	●
Post Wrap Cable Tests	●	●
Moulding / Heatshrinking	●	●
X-RAY	●	●
X-RAY Assessment	●	●
Post Mould Cable Tests	●	●
Joint Closure	●	●

Key	
● Exempt	● Outstanding
● Started	● Finished
● Parked	

The Joining Status Viewer has two functions. Not only does it indicate the status of the joint on the computer in the joining area and also on separate computer screens elsewhere in the vessel, but it is also the Control Screen for JADE. By clicking on the appropriate buttons, sub-menus are displayed for starting, completing and parking the particular section. When the section is complete, the button changes colour to green.

Returning to the actual JADE construction manual on the left, this will typically display 150 pages for an armoured joint, though many are Reminder pages. The first set of pages display the statutory health and safety warnings and then the technical content follows.

The jointers work through the interactive manual, registering completion of the various sections. At particular stages, measurements will be required and these must be entered. An example of this is with ferrule pressing, where up to 12 measurements are entered and the mean swaged values are automatically calculated. If re-work is necessary, the appropriate screens re displayed and jointing times are re-calculated so re-work times are recorded.

GMSL - Jade - Ferrule Press Results

Global Marine Systems

Cable End A: ASN DALC4/17mm SA

Jointer

- K Coaten
- Russell Agapito
- Hamish Barr
- Shift Jointers

Flange	Centre	Cable
17.40	17.10	20.46
17.30	17.39	20.15
17.55	17.25	20.37
17.61	17.18	20.18

Averages

17.47	17.23	20.29
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Lower/Upper Tolerances

17.30	17.00	20.00
17.80	17.40	20.50

Key

- Underpressed
- Acceptable
- Overpressed

OK Cancel

A Typical Ferrule Pressing Screen

When the fibre splicing stage is reached, the jointer has a choice of using the T35SE or the UJS-S100 fibre splicer and a full set of fibre types is displayed with their corresponding splicing parameters.

GMSL - Jade - Fibre Splice Parameters Selection

Global Marine Systems

SPLICER TYPE

SUMITOMO TYPE 35-SE UJ_UC FUSION SPLICER UJS-S100

Corning LEAF Spliced To Corning LS

PARAMETER VALUES

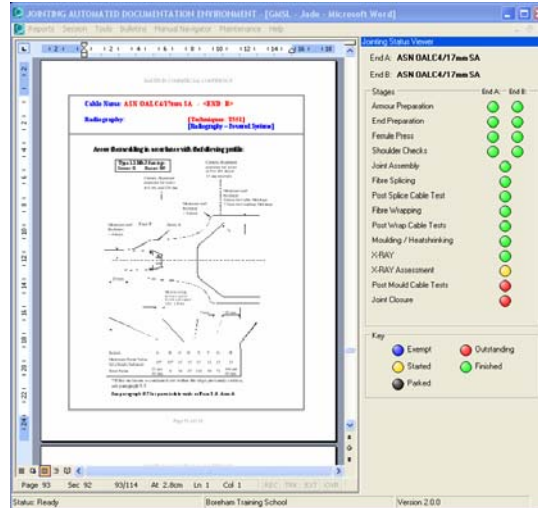
Abbr. Name	COR LEAF-COR LS		
Fusion Duration	1.5	Prefusion	0.05
Arc Gap	8	Overlap	8
Arc Power	8	Profile Type	DSM
IN_OUT Ratio	Adjust		
Qualified By	KDDI-SCS		

Close

Fibre Splicing Parameter Screen

When the moulding stage is reached, JADE automatically displays the diagrams for single or double end cooling as appropriate. If the joint is a heatshrink type, then this procedure is displayed instead of moulding.

At the radiographic inspection stage, the correct X-ray profiles are displayed.



And during the armour assembly, JADE automatically determines the order of assembly and pressing.

At the end of the process, a Completion Report is generated, which can be emailed back to headquarters and used as part of a larger report for the customer.

This scenario was for a UJ joint, but JADE also caters for UQJ and the appropriate storyboards and sections are automatically included.

THE BENEFITS OF JADE

JADE has been embraced wholeheartedly by Global Marine jointers as it provides the construction manual information in an easy to understand format and caters for a wide range of skills. JADE has improved jointing accuracy by eliminating the need to peruse large amounts of text for the specific cable information required and also by providing the vessels with updates as soon as they are available. Speed of jointing has also improved by having all the information to hand without having to search the UJCM for it and by the presence of electronic record keeping instead of hand-written logs that have to be typed up afterwards. Further time is saved by the immediate generation of the Completion Report which provides all records in one place in a textual and graphical format.

Global Marine uses the statistics generated by JADE to monitor jointing quality and time. At present, the data is transferred to another programme to analyse trends and improvements in quality, but it is envisaged that future iterations of JADE will incorporate this facility.

These improvements in quality and speed of jointing can bring nothing but benefits to cable owners who will see their cable back in service even quicker than before. If systems such as JADE were adopted throughout the submarine cable industry, record keeping would be enhanced and cable owners could compare results on a like to like basis.

JADE has the ability to be used on an international basis and by several companies. If JADE was adopted as a standard for the dissemination of construction manual information and for the generation of jointing reports and statistics throughout the industry, it is envisaged that one central database and document repository would exist but each company would retain their individual data. This would include personnel, vessels, completion reports etc. JADE is compatible with a range of email systems, so any amount of vessels and locations could be updated simultaneously.