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The offshore oil and gas construction



The black sea

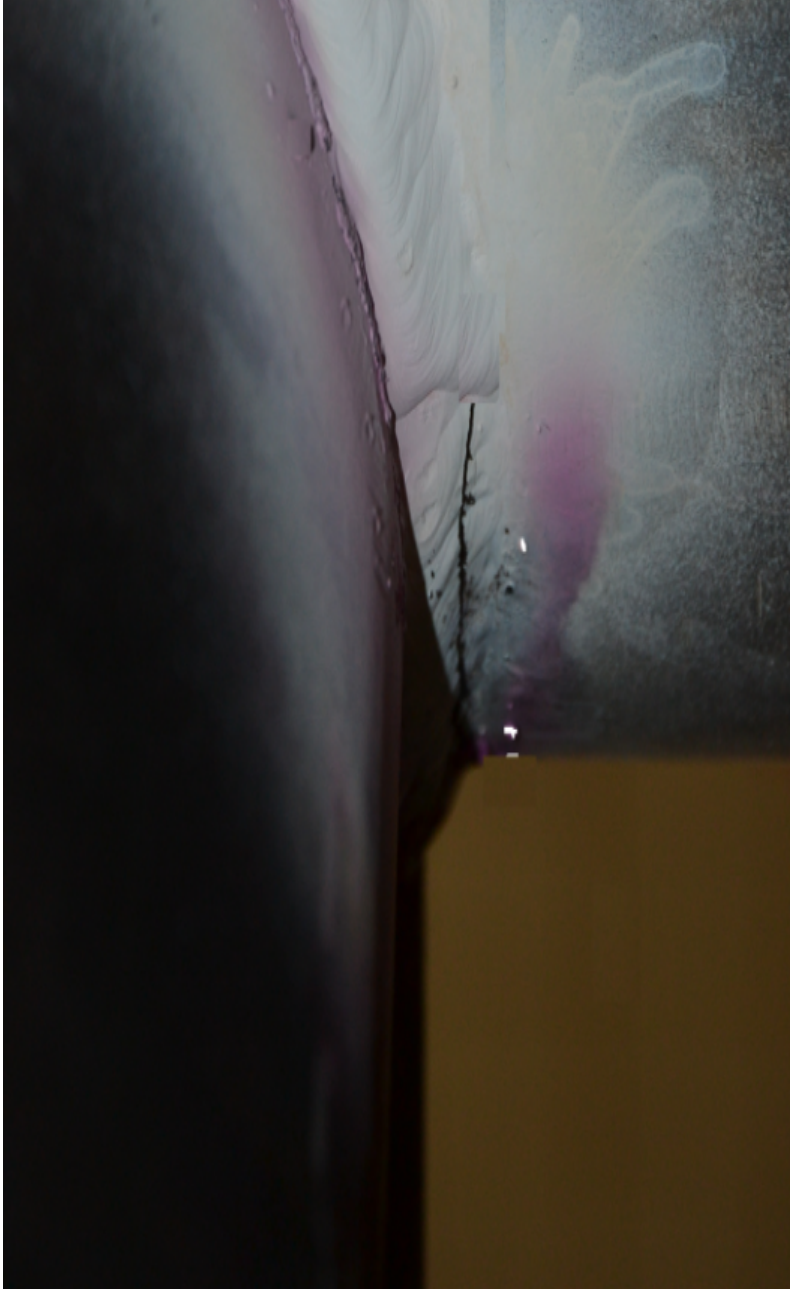


The black sea

The offshore oil and gas construction



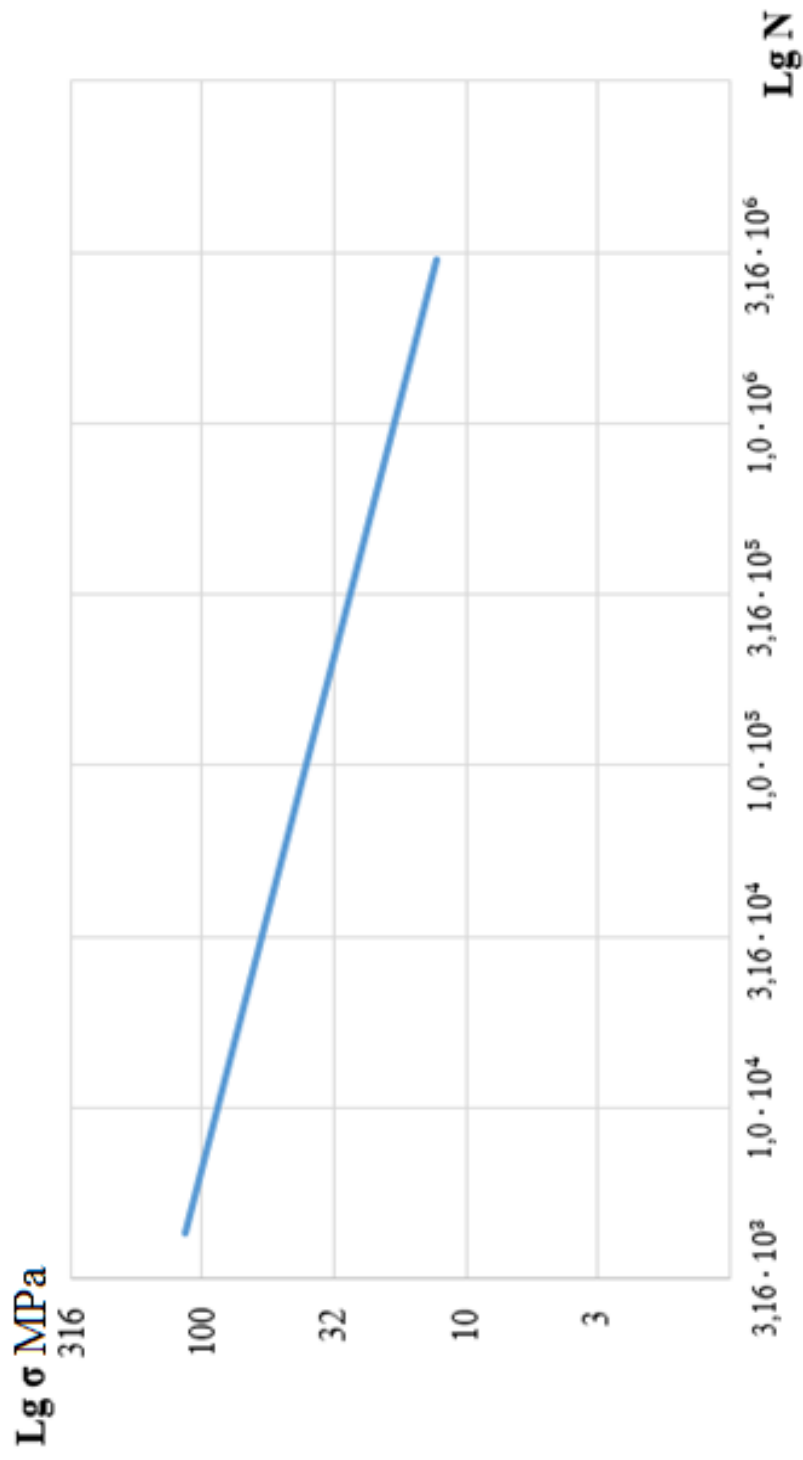
The primary crack in the welded joint of the experimental plant



The number of cycles N to failure obtained during the test of repaired welded joints

Voltage amplitude σ_a , MPa	Model number				Average	Dispersion	Standard error	Confidence interval	The number of cycles to failure, N
	1	2	3	4					
Restored welds «Г»-type									
54	40100	41400	42900	43036	41857	1387	693	2205	41857 ±2205
90	8232	9652	9014	9305	9041	604	302	961	9041 ±961

Fatigue diagram of OOGP welded joints repaired using crack welding and cracking technology



The equation describing fatigue processes of repair joints

$$\sigma_a = 216,915 + 13,9917 \ln N,$$

where:

Characteristics of amplitude variable blocks in a welded joint of a support block OFP

Wave height, h	Amplitude of variable voltage \dot{y}, σ_a	The number of cases of amplitude repetition in the block, $\nu i \sigma$	t	σ_i / σ_{max}
11,2	41	430	$1,41 \cdot 10^{-5}$	$1,408 \cdot 10^{-5}$
9	30	2425	$7,94 \cdot 10^{-5}$	$5,811 \cdot 10^{-5}$
7	20	8447	$27,7 \cdot 10^{-5}$	$13,49 \cdot 10^{-5}$
5,5	16	22912	$75 \cdot 10^{-5}$	$29,28 \cdot 10^{-5}$
4,5	12	48386	$158,5 \cdot 10^{-5}$	$46,38 \cdot 10^{-5}$
3,5	10	514688	$168,6 \cdot 10^{-4}$	$41,11 \cdot 10^{-4}$
2,5	8	974097	$31,9 \cdot 10^{-3}$	$6,22 \cdot 10^{-3}$
1,5	7	2421847	$7,93 \cdot 10^{-2}$	$1,35 \cdot 10^{-2}$
0,5	5	7539179	$24,69 \cdot 10^{-2}$	$3,011 \cdot 10^{-2}$
<0,5	3	18849092	$62,23 \cdot 10^{-2}$	$5,0086 \cdot 10^{-2}$

Characteristics of amplitude variable blocks in a restored welded joint of an OFP support block

Wave height, h	Amplitude of variable voltage $\bar{\sigma}_a$	The number of cases of amplitude repetition in the block, $\nu_i \bar{\sigma}$	t	$\bar{\sigma}_i / \bar{\sigma}_{max}$
11,2	41	430	$52,05 \cdot 10^{-4}$	$52,05 \cdot 10^{-4}$
9	30	2425	$29,35 \cdot 10^{-3}$	$21,48 \cdot 10^{-3}$
7	20	8447	$10,22 \cdot 10^{-2}$	$49,88 \cdot 10^{-3}$
5,5	16	22912	$27,7 \cdot 10^{-2}$	$10,82 \cdot 10^{-2}$
4,5	12	48386	$58,57 \cdot 10^{-2}$	$17,14 \cdot 10^{-2}$

Conclusion

1. Fatigue diagrams used for new welds cannot be used with this repair method.
2. The resource of a repaired welded joint by the method described in the article is significantly lower than that of a new joint, which requires a further assessment of the effectiveness of various welding joint repair technologies.