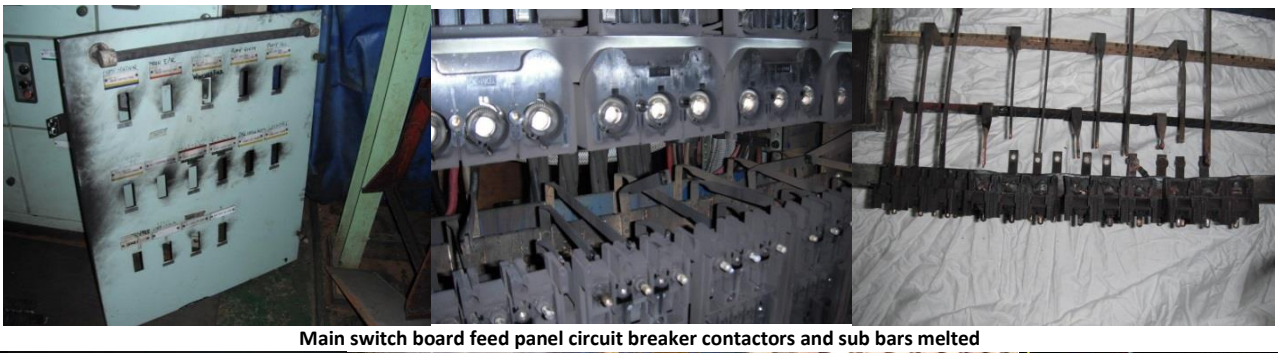
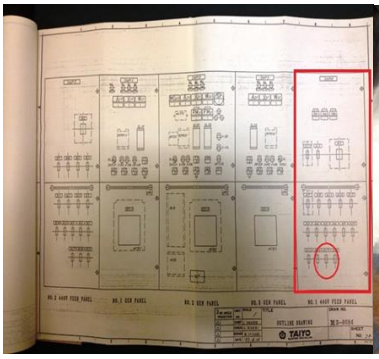
MAIN SWITCH BOARD FEED PANEL SHORT CIRCUIT

What happened

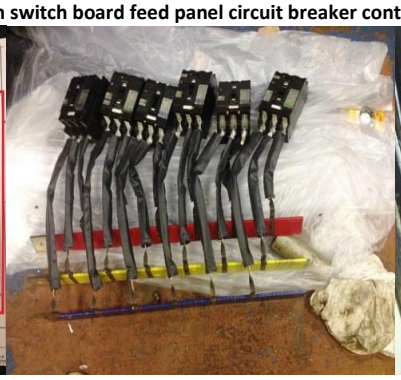
The cruise ship was about to sail from port.
The power configuration was with all 3 DD/GG on net with an average load of 200 KW each with the biggest users the three A/C compressors at 100 % load.
Suddenly DD/GG # 2 and # 3 opened the breaker and went out from net causing a temporarily drop of voltage for less than a second, overloading the DG no.1.
Due to high load the preferential trips sequence was activated automatically making D/G no.1 able to remain on line.
An Investigation was immediately carried out on Main Switch Board (MSB) by the Chief Electrician who reported black smoke coming out from forward lower cubicle of the MSB (No.1 feed panel 440 V 60Hz).
The Chief Engineer informed the Bridge about the need to de-energize the MSB and consequently to black out the ship: the breaker of D/G # 1 was opened from ECR by purpose, causing the black-out; the Emergency Diesel generator started automatically.



Main switch board feed panel circuit breaker contactors and sub bars melted

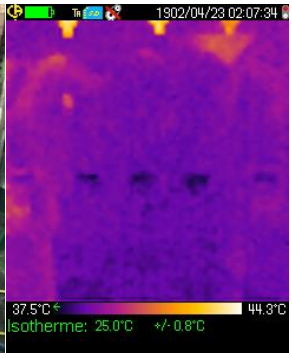


Main switch board drawing



New breakers

Job completed



Final thermography

Immediate actions taken on board:
New feed panel no.1 cable connections to the bars arranged and all affected circuit breaker replaced, at satisfaction of the Class society. A thermal image was carried out of the entire MSB.
The ship restored the power after almost eight hours.

Root causes/contributory factors

Root Causes and contributory factors:

- Initial failure was identified on the Circuit Breaker A17 (Starting Air Compressor #1) which due to overheating , lost its insulation generating a short circuit with the Circuit Breaker A16.
- Smoke and heat have affected the insulation of whole feed panel cubicle, overheating of the MSB feed panel no.1 itself.
- The Main Switch Board that in the forward platform, upper level of the MM/EE room, could have been affected by higher temperature, and mixtures due to a lack of ventilation in the area.
- The MSB feed panel circuit breakers, with base frames and tulips contacts, was found defective

Proposed Corrective/Preventive Actions

The Company:

- Replace circuit breakers and panel
- Relay Protections testing by injection of the secondary transformers current and Main Generator Breakers.
- Perform new thermography to all the Main Switch Breaker
- Perform same verifications on MSB feed panel no.2
- Install BUS TIE Breakers in the Main Switch Board.
- Develop study and feasibility in way to ascertain a Change over Feed Panel with Essentials feeders in emergency scenario.(Integration of 2 BUS TIES to replace the LINKS as redundancy).
- Circulate this Case Study to all managed ships as lesson learned to prevent recurrence.

The Vessel:

Implement:

- Daily monitoring of the MSB feed panel circuit breaker base frames contact temperatures.
- Regular cleanness and tightness of all the Main Switchboard and Bus-bars decontamination
- Amend planned maintenance accordingly

Reference

ISM CODE 10: Maintenance of the ship and equipment
LVMS : Ship operation – Maintenance& Operation overview

Completed