

一、概述 General:

1. 本工艺适用于 600TEU 集装箱船滑油循环管路的表面处理和串油清洗。

This procedure is applied to the surface treatment and oil flushing for LO circulating pipeline of 600TEU container vessel.

2. 目的: 经过对滑油系统中管件的表面处理, 管路、附件及阀件等进行压力清洗, 以去除制造、安装过程带来的机械杂质, 确保滑油系统的正常运行。

Purpose: surface treatment for pipe fittings of LO system and pressure flushing for pipelines, accessories and valves to be carried out to remove mechanical impurities caused by fabrication and installation and ensure normal running of LO system.

二、参照标准 Reference Standards:

1. CB/T 3790-1997 《船舶管子加工技术条件》

CB/T 3790-1997 《Processing Technology Conditions for Vessel Pipes》

2. CB*/Z345-85 《船舶管系布置和安装通用技术条件》

CB*/Z345-85 《General Specifications for Vessel Piping Arrangement and Installation》

3. CB/T 3760-1996 《钢管、铜管、铝管的化学清洗》

CB/T 3760-1996 《Chemical Cleaning for Steel, Copper and Aluminum Pipes》

三、清洗工艺流程 Flushing Procedure:

1 流程 放样管子车间预制→密性试验→管子船上配装→拆卸管路, 进行表面处理、管子外部涂漆→内孔串酸清洗、淡水冲洗钝化、吹干燥空气→两端封堵→管子船上安装→串油清洗、报验→主机滑油柜报验→系统效用试验

Process: pre-fabrication at lofting pipe workshop→tightness test→pipe fitting on board→pipeline dismantlement, surface treatment 、outside painting for pipes→pipe bore pickle flushing 、fresh water flushing, passivation, dry air blowing→both ends blanking off→pipe installation on board→oil flushing, Class survey→Class survey for M/E LO→system performance test

2 操作要求 Operation Requirements

2.1 所有的管件按图纸要求进行焊接, 并将焊缝打磨光滑。

Welding for all pipe fittings to be carried out according to drawings and welding seams to be grinded

2.2 管路制作完成后，进行密性试验。

Tightness test to be carried out after pipeline fabrication is completed.

2.3 密性试验后，进行管件的船上配装。管件船上配装时，按管子安装顺序，逐批安装到船上指定位置。

Pipe fitting on board to be carried out after tightness test. During pipe fitting on board, pipes to be installed in place on board batch by batch according to the installation sequence.

2.4 在管路船上配装结束后，将放样管及船校管拆卸，拿至内厂进行表面处理。表面处理完后，将管路淡水冲洗钝化，然后将管件外表面吹干，涂漆。

After pipe fitting on board, lofting pipes and reshaping and reshaping and positioning pipes to be dismantled and moved to workshop for surface treatment. Afterwards, fresh water flushing、 surface passivation, and the outside surface to be dried and painted.

2.5 表面涂漆后，利用耐酸泵将管路连成一个循环系统进行内孔串酸清洗。清洗时间至少为 24h，在 1h 内无硬粒和大面积污迹，则认为管路的清洁达到要求。此过程船东需在场。

After surface paint coating, bore pickle flushing in a circulating system of the pipelines connected by acid-proof pumps. Flushing lasts for no less than 24h. Pipeline cleanness is regarded as reaching the standard if there is no hard grains and large area of smudge within 1h flushing. Shipowner Representative (hereafter Shipowner) should be present during this process.

2.6 串酸结束后，采用干净的淡水冲洗管路内孔，每隔 1h 测试管子表面的 pH 值，当钢管的 pH 值在 7~10 的范围时，继续冲洗 1h。用钝化液串 10min，然后用干燥压缩空气吹干管路。

After pickling, the pipeline bores to be flushed with clean FW and ph value of pipe surface to be tested every 1 hour. When ph value of the pipe surface is between 7 and 10, continue to flush 1h. Passivate for 10 min. And then blow pressure air.

2.7 清洗结束后，将管路两端用锡箔胶带封堵，分托盘吊至船上等待安装。

After flushing, both ends of the pipelines to be blanked off by tin foil adhesive tape and lifted to board in separate pallets for installation.

2.8 管件船上安装时，按管子安装顺序，逐批安装到船上指定位置，在安装时要确保连接一根管子的一个接头打开一个锡箔胶带封头，严禁同时打开多根管子的封

头，以防止清洗合格的管子在安装过程中造成污染。

During pipe installation on board, the pipes to be installed in place on board batch by batch according to installation on board. Ensure that only one tin foil adhesive tape end cover for one connection of one pipe is opened during installation. Simultaneously opening of several pipe end covers is forbidden to prevent the well-cleaned and qualified pipes from being polluted during installation.

2.9 当滑油管在船上安装妥当后，采用专用的循环油泵、滤器和循环油柜，采用系统用滑油，油液在投入使用前应检验油品并保证合格。串油前，应将系统中的阀件、附件拆下，主机、辅机等设备的进出口利用干净的盲板法兰隔离，通过旁通管路连成循环回路，并确保系统具有良好的密性。系统串油，每隔 1h 检查滤器，系统串油清洗应连续进行，串油时间至少 10h。为增加串油效果，用木锤从外部轻轻敲击管路，同时增加管路中油的流速。此过程船东需在场。

When the LO pipes are installed in place on board, special circulating oil pumps, filters and circulating oil tanks to be adopted. LO used for the system to be used for oil flushing. Flushing oil sample to be inspected before operation and its qualification to be ensured. Before flushing, to dismantle the valves and accessories of the system, and to blind the LO inlet/outlet to ME/AE etc. with clean blank flange and connect the bypass pipes to form a circulation. Make sure that the system should have favorable tightness before oil flushing. The filter should be check every 1 hour during system oil flushing which should be carried out continuously and last for no less than 10h. In order to facilitate flushing, the pipelines to be knock by a mallet to increase oil flow speed in the pipeline. The shipowner should be present during this process.

2.10 清洗检验工作在船东在场的情况下操作，在滑油清洗系统末端对清洗油进行取样，取样滑油随船东和船厂检查员一起送至检验部门检验。滑油管路清洗标准应达到 NAS 1638 10 级。

Inspection for oil flushing to be carried out at the presence of Shipowner. Flushing oil sample to be taken at the end of the LO flushing system. The oil sample to be sent for analysis to inspection department together with Shipowner and Quality Control man. The flushing standard of LO pipelines should reach NAS 1638 10.

2.11 将主机滑油舱清理干净，保证任何死角没有残余物。并取得船东和船厂检查员的认可。

M/E LO tank to be cleaned. Make sure there is no residue at every dead corner. And the result is approval led by Ship owner and Quality Control man.

2.12 所有相关的试验和清洗工作结束，并且达到验收要求后，将系统中的清洗用油完全泄放。管路吹压缩空气以确保系统中无残油。然后将检验合格的系统用油加入系统。至此，整个滑油管清洗结束。

After all relative tests and cleaning procedures done, and found satisfactory, flushing oil used to be totally drained from the system. Air blow the system to ensure that no flushing oil left in the system. Fresh engine oil can then be poured/pump into the system. This completes the cycle of the proper treatment of oil pipes.

2.13 系统效用试验 在管路串油清洗完成后，用清洗干净的盲板法兰隔离控制元件，进行各回路效用试验；试验设备采用系统油泵及滤器；试验时先作低压循环以排除管路中的空气，然后逐步加压到各回路需要的压力保持 10 min，检查各回路有无泄漏现象；若系统中出现不正常声响时，应停止试验，待彻底查清原因并解决后，再进行试验；试验过程中要定时检查滤器的清洁状况，至滤网洁净无污物为止，试验结束。拆除盲板法兰恢复系统使用工况。

System Performance Test: After pipeline oil flushing, well-cleaned blind flanges to be used for segregating control components and functional test to be carried out for every circuit. Oil pumps and filters for the system to be used for test. At first, low pressure circulation to be carried out to get rid of air in pipelines. Then every circuit to be pressurized to the required pressure that should be maintained 10min. Check if there is any leakage of the circuits. If there is abnormal sound in the system, the test should be stopped until the cause is found and solved thoroughly. The cleanness of filters to be checked during the test. The test can be stopped until there is no dirt on filter screen. Then blank flanges to be dismantled to store system operation condition.