PartC – Mooring Ropes – High Modulus Synthetic Fiber lines (AS APPLICABLE)

LineInstallation

·Line installation guidance is provided by the linemanufacturer (See **appendix C**) toensure any product-specific considerations are understood and accounted for.
·Handling High Modulus Synthetic Fiber (HMSF) linesinvolves the placement of some form of chafe protection.
·These can be fixed in place or floating on the line foradjustment to different terminal arrangements and ballast conditions.

Split Drums

Where splitdrum winches are used, guidance on the minimum numbers of turns on the tensionside of the winch drum is to be obtained from the line manufacturer.
Notes: **As per maker"SAMSON" Rope manual in appendix C & Mooring System Management Plan: " Asplit drum winch should always have minimum of eight (8) wraps of rope on thedrum at all times while a second layer of wrap is not permitted as long as this is unavoidable. This is to ensurethat the connecting point of the rope to the winch does not go undersignificant load."**
Reference
·Appendix C - Sampson Rope Manual- Page 52: Rope handling/usage. Installing/Tension winchlines.

Storage

·All HMSF lines should be stored out of direct sunlightand away from extreme ambient temperatures in accordance with themanufacturer's guidance.
·Lines should be kept off the deck to provide ventilationunderneath and to prevent contamination from chemicals.

•Keep the HMPE roles clean: wash them with tapwater on a regular basis to remove any dirt or sea salt (that will act as"razors" and damage the fibers when dry).
·Lines should be inspected for damage before deployingthem from storage into service.
·Mooring lines installed on winches should be covered withsuitable waterproof tarpaulins or clean cloth when not in use.

• In connecting the rope to the winch drum, it is suggestedto avoid any damages if "U" bolts are used because the end of the rope will bethe new working eye when the rope is turned end for end.

• Working in high ambient temperatures (above 45 degreesCelsius, up to 70) can reduce the service life of the HMPE lines. On the otherhand, below zero temperatures impose no danger for the rope (working limit isminus 100 degrees Celsius).
Vessels with HMPE have been supplied with repairkits and lubricant.
Reference
·Appendix C - SAMSON Rope manual & Mooring SystemManagement Plan for the handling & storage of HMPE ropes. Pg.57: Storage

Maintenance

The effective maintenanceguidance and inspection of mooring lines is provided by the line manufacturerand is available in appendix C.
Reference
Appendix C –SAMSON Rope manual & Mooring System Management Plan for the handling/usageof HMPE ropes. Pg. 60 Rope Inspection and Retirement

Additionally, Maintenance activities for HMSFlines include the following:

·Monitor and remove induced twist in accordance with theline manufacturer recommendations;
·Maintain the chafe protection to make sure it is workingproperly and can be safely deployed;

•Pay an extreme caution to spring lines andensure that they are not touching the side shell and the rope's angle at thechock is not very large.
·Keep deck equipment (rollers, fairleads, chocks) surfaceconditions free of defects and sharp edges in accordance with the linemanufacturer's recommendations;

• After the use Rollers, fairleads, chocks should be wellmaintained and painted before the rope is deployed but paint should be dry toavoid taking paint off surfaces, bunching paint or creating sharp paint shards.
·Mitigate excessive localized damage;
·Splices should always be inspected to ensure that remain intact and/orin acceptable condition.
·Cover winches when lines are not in service;
·Monitor the condition of jacketed HMSF lines and repairin accordance with the line manufacturer recommendations;
·Follow instructions for cleaning lines when they arecontaminated with oil or other commonly used petroleum lubricants.
·In order to minimize HMSF mooring lines suffering fromabrasion, fairleads and other contact surfaces should be maintained, clean,smooth and rust-free.
·Consideration should be given to fitting chafe protectionto the section of line passing through the fairlead. Ship personnel should takecare to maintain the effectiveness of the chafe protection.

• Never let tworopes rub one another when they are under tension. There can be excessive heatbuild-up that will damage the fibers locally and impose a weak point in theline.

• Ensure that the colored lines of the jacket remain straightwhen under load, same when collecting the rope to storage and tension drums.Twists reduce the strength and damage the fibers and strands construction.
·Mooring rope time in use records should be maintained in‘digiMoorX7’ software.
Reference
·Appendix C - SAMSON Rope Manual for manufacturer’sguidance on maintenance and Pg. 60 onwards - Rope inspection and Retirement

Tools andresources required

All Companyvessels are suitably equipped with the correct tools required for maintenanceand repairs of mooring ropes as guided by the manufacturer (Appendix C).
See Appendix C for a List of tools requiredfor maintenance of ropes.

Inspections

·Deployment inspections are carried out by the mooringteam prior to every use as described in the Mooring System Management Plan.
·Crew members carrying out the deployment inspectionsshould have been trained according to Company requirements and manufacturer’sguidance – Appendix C.
Reference
Appendix C - SAMSONRope Manual: Pg.60 onwards - Rope inspection and retirement.
During thedeployment inspection, the working length of the line (outboard of the tensionside of the winch) should be inspected for defects which may impair theperformance of the line.

Avoid dragging the rope over rough surfaces (anti-slipping deck areas),but in any case, dragging will result jacket to develop a fur which is normaland will not cause any weakening of the rope to any extend.

While berthed ensure that all the mooring lines are properly tensionedto get the same strain and load. Some ropes fast to berth side bollards in along distance usually have a small sag, do not confuse it as a slack rope.
Incident reportsshould be issued in case of line failure or significant damage and themanufacturer contacted when needed. Decisions whether to go ahead/not go aheadwith using lines in mooring operations can then be made and repairs should beproperly documented.
On completionof each unmooring operation, the Person in Charge of the mooring station shouldvisually inspect mooring lines and inform the Master if excessive deteriorationin the condition of the mooring lines is noticed. With this information theMaster can then consider increasing the inspection frequency of the relevantmooring ropes and has the authority to discontinue use of the mooring lines.
Routineinspections should be carried out regularly (frequency depending on berthing frequencyand environmental severity) and records of these inspections maintained. Onlyqualified and experienced personnel should be responsible for inspecting HMSFlines in service.

Inspections aretypically carried out by visual assessment. The main areas of deteriorationHMSF lines are external and internal abrasion, cut yarns/mechanical damage andinduce twist. Areas that should be regularly inspected include:
·The sections of the line in wear zones, particularlythose sections that run regularly through deck fairleads and pedestal rollers.
·The section of the line at the crossover point on splitdrum winches.
·The eye, the eye splice, the crown of the eye andsections of line close to the eye that may have been damaged through abrasionor contamination on berths.

Any sharp bend in a rope under loaddecreases its strength substantially and may cause premature damage andfailure. Avoid making knots at all costs. They can reduce the line's strengthby up to 50%.

Detailedinspections

•In case anyquarterly Inspection of the Rope - the Wear Zone (i.e. the section of the ropefrom the end of the eye up to the winch drum which is expected to be exposedduring mooring operations for a particular rope which may vary from 40 to 80 mdepending on the location of the rope) must be thoroughly checked withreference to LMP and OEM guidelines.
•If theresultant of the inspection qualifies the rope to be graded more than 5 foraverage internal & external abrasion, then office is to be informedimmediately with additional information & inspection photos to be submitted.
•From rating 5and above the rope is to be monitored closely for the condition & if therating is 7, then the rope is to be discarded.

Wear ZoneManagement

·The minimum length of line will vary depending on thesize of the vessel.
·Based on standard industry guidelines the length of ropefrom the fairlead of the vessel to the shore hook will vary between 30 and 50 metres and the vessel should have sufficientlength to meet these criteria.
·This length will also depend on the distance of the shorehook from the vessel's freeboard during cargo operations, environmentalconditions, length of mooring tail, ship movements of the berth and ship/berthcompatibility.
·This information shall be considered duringcondition-based evaluation on board the vessel. Ropes should be protected whennot in use to reduce exposure to the sun and weather conditions.
·Spare ropes should be stored away from heat-generatingsources and chemicals.
·Where possible, the space should be adequatelyventilated.
Furtherguidance on wear zone management is given in the Mooring System Management Plan& Appendix C – Maker Manual for SAMSON ropes.
·All mooring lines are susceptible to mechanical damagefrom exposure to contact surfaces, particularly while under tension and,because of this, deck fittings should be regularly inspected and kept smoothand free from chafe points.
·Steel fairleads should be kept clean, smooth and rustfree.
·Where appropriate, Chafe Guards should be fitted toimprove the condition of contact surfaces.
·Roller fairleads and other rotating deck equipment shouldbe well maintained and kept free to rotate as originally designed.

• After few mooring operations the rope's diameter shouldbe recorded due to yarns and strands proper alignment especially within theworking length. This diameter should be recorded to enable future comparisonmeasurements.
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Reference
·Appendix C - Maker Manual for SAMPSON: Pg.44: Use & Maintenanceof Chafe Guards.
All mooringropes that are fitted on the winches should be rotated periodically as detailedin Mooring System Management Plan (MSMP) in order to ensure that ropes, whichare exposed to heavy load conditions, are not exposed for extended periods;this practice will increase their service life. In order to ensure continuity,the ropes should be rotated irrespective of whether they have been replaced.

Service lifeand Retirement Criteria

•The HMPE ropes to be replaced basis belowcriteria, whichever is applicable first:
•Every8 years from the time put in use, with End to End changed every year (12months)and ropes to be rotated every 2.0 years.
•Tobe discarded if resultant rating for the inspection is "7", Refer to LMPregister sec-1 & 2.
•If the residual strength available of therope is less than 75% of ship design MBL of original ascertained by strengthtest after the 7th year.
·When the lengthof the mooring rope is reduced due to damage and cannot be used on board formooring operations, the rope should be retired and replaced.

PartC – Mooring Ropes – High Modulus Synthetic Fiber lines (AS APPLICABLE)

LineInstallation

- Line installation guidance is provided by the linemanufacturer (See **appendix C**) toensure any product-specific considerations are understood and accounted for.
- Handling High Modulus Synthetic Fiber (HMSF) linesinvolves the placement of some form of chafe protection.
- These can be fixed in place or floating on the line foradjustment to different terminal arrangements and ballast conditions.

Split Drums

Where splitdrum winches are used, guidance on the minimum numbers of turns on the tensionside of the winch drum is to be obtained from the line manufacturer.

Notes: **As per maker"SAMSON" Rope manual in appendix C & Mooring System Management Plan: "Asplit drum winch should always have minimum of eight (8) wraps of rope on thedrum at all times while a second layer of wrap is not permitted as long as this is unavoidable. This is to ensurethat the connecting point of the rope to the winch does not go undersignificant load."**

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Storage

- All HMSF lines should be stored out of direct sunlightand away from extreme ambient temperatures in accordance with themanufacturer's guidance.
- Lines should be kept off the deck to provide ventilationunderneath and to prevent contamination from chemicals.

- Keep the HMPE roles clean: wash them with tapwater on a regular basis to remove any dirt or sea salt (that will act as"razors" and damage the fibers when dry).
  - Lines should be inspected for damage before deployingthem from storage into service.
  - Mooring lines installed on winches should be covered withsuitable waterproof tarpaulins or clean cloth when not in use.
- In connecting the rope to the winch drum, it is suggestedto avoid any damages if "U" bolts are used because the end of the rope will bethe new working eye when the rope is turned end for end.

- Working in high ambient temperatures (above 45 degreesCelsius, up to 70) can reduce the service life of the HMPE lines. On the otherhand, below zero temperatures impose no danger for the rope (working limit isminus 100 degrees Celsius).

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freeboard during cargo operations, environmentalconditions, length of mooring tail, ship movements of the berth and ship/berthcompatibility.

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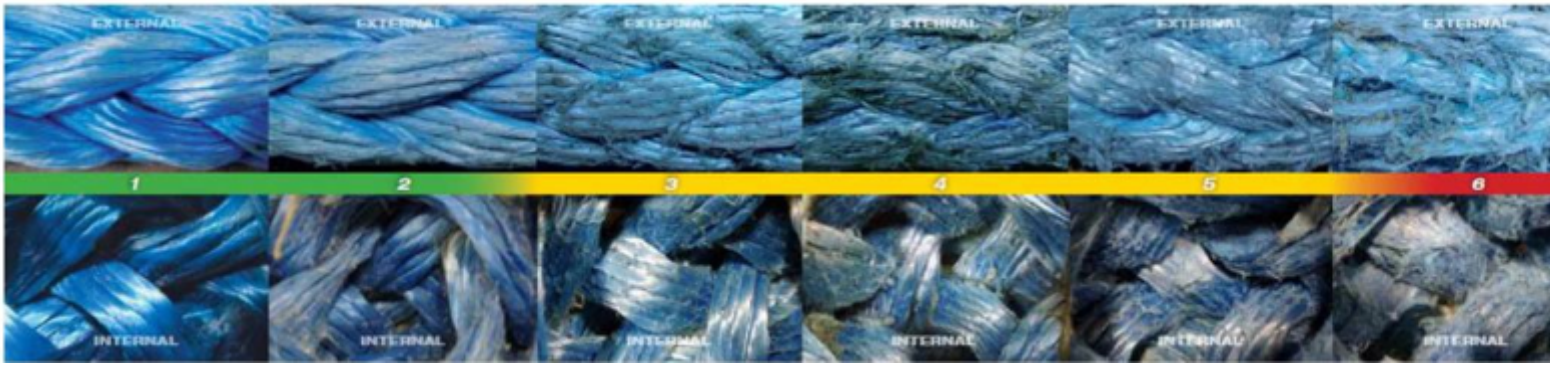
Service lifeand Retirement Criteria

- The HMPE ropes to be replaced basis belowcriteria, whichever is applicable first:
- **Every8 years from the time put in use, with End to End changed every year (12months)and ropes to be rotated every 2.0 years.**
- **Tobe discarded if resultant rating for the inspection is "7", Refer to LMPregister sec-1 & 2.**
- **If the residual strength available of therope is less than 75% of ship design MBL of original ascertained by strengthtest after the 7th year.**
  - When the lengthof the mooring rope is reduced due to damage and cannot be used on board formooring operations, the rope should be retired and replaced.



Visual comparison, illustrating the seven levels ofinternal and external abrasion

Careful condition assessment shall be carriedout for both synthetic and HMSF ropes considering the criteria provided in the MSMPand manufacturer's recommendations and any decision to retire the ropes shallbe based on the condition assessment.

Residual Strength Testing:

One of the HMPE ropes sections to be send for residualstrength testing & analysis after completing 7 years in service in order toverify the condition of the rope & expected remaining life of the rope.

Vessel to choose the most used rope in service and a pieceof appox. 10m in length to be sent to themanufacturer as a Sample, for the residual strength testing.

Basis theresults where residual strength available is more than 75% of the ship designMBL and number of hours rope completed in service, company will ascertainremaining service life of the ropes.

Reference

Makers Manual “SAMSON” in Appendix C forRetirement Criteria for HMPE ropes. Pg.43

TheCompany should be consulted as and when required or when rope is damaged andcannot be used on board for mooring operations & it should be retired andreplaced.

Certificates

Certificatesfor HMSF mooring ropes are filed in appendix C.