Shell Marine

CHANGING OVER TO SHELL LUBRICANTS

INTRODUCTION

Although it is very rare to experience compatibility difficulties while changing lubricant suppliers, there remain differences in lubricant chemistry and properties that require care to be exercised at the time of changeover. This guidance note is intended to provide best practice to assist ship staff in systematically managing the risk of product changes when switching over to products from Shell Marine.

Although Shell Marine has exercised great care in the preparation of these guidelines, it will not be held liable for any losses or damage resulting from any inadvertent omissions or errors.

Ship staff are strongly advised to familiarise themselves with the Shell Marine lubrication survey for the vessel, the product data literature covering the marine lubricant grade portfolio and this guideline ahead of implementing the changeover.

If you have any queries or require any further information on any aspect of changing over to Shell lubricants, please contact your local Shell Marine representative.

GENERAL GUIDANCE

Providing the existing oil in service is in good condition, Shell Marine would not expect any adverse reaction when mixing Shell lubricants with a similar competitor's product. Nevertheless, the full performance benefits of the Shell oil will not become evident until the oil charge is 100% Shell product. It is advisable to limit the rate of adding new oil to a maximum of 10% at a time, see the "Mixing different lubricants" section for further information.

Although there is no standardised ISO or ASTM procedure to prove the compatibility of product mixtures, a simple test can be carried out on board: mix a sample of the current oil in use with the new Shell grade at a 50:50 ratio in a glass, shake it and place the glass in a warm area. Any deposit visible on the bottom of the glass after a few days may indicate additive fall-out and incompatibility.

Please contact your local Shell Marine Technical representative for further guidance on compatibility checking. Additional reassurance can be sought by taking representative samples for Shell Rapid Lubricants Analysis (RLA) testing from the tank/working sump before and after the new oil has been added and mixing has occurred. This can provide information on whether the bulk of the oil in use retains effective levels of additive protection.

CAUSES AND SIGNS OF INCOMPATIBILITY

Differences in additive chemistry are the usual cause of incompatibility. If incompatible oils are mixed, insoluble material may form and deposit in the oil system. There have been cases where greasy substances have plugged lines and filters in circulating systems and caused equipment shutdown. Analysis of these substances showed they were derived from oil additives.

If a mistake has been made by adding the incorrect grade to a system, please contact your local Shell Marine technical representative for further guidance.

MIXING DIFFERENT LUBRICANTS

The operating performance for which particular oils are designed can be impaired if oils with different additive packages or different types of base oil are mixed together. There is a range of potential consequences:

- technical: the performance of the mixed product may be unpredictable
- commercial: the mixed grade may not perform any better than its cheapest component
- warranty issues: no oil company will guarantee a particular performance level for their product if it has been mixed with a competitor's grade or a product designed for a different application.

Engine oil contamination of hydraulic or turbine oils, even at very low concentrations, can cause the anti-foaming additive present in these oils to drop out. This can lead to foaming and equipment breakdown.

GENERAL PRINCIPLES

Whenever mixing is necessary, only a small amount (10% of total volume) of the new product should be added to the existing oil. Before mixing, both lubricants must be in good condition in terms of physical and chemical properties.

Mixing of fresh oils is different from mixing of used oils. A used oil is not well characterised. It may contain high amounts of water; it may have been in service for extremely long periods; it may even be a mixture of products itself.

CYLINDER OILS

It is good practice to avoid any mixing of different types of cylinder oil. However, if it is necessary, then it is better practice to empty the cylinder oil tank as much as possible before topping up with different cylinder oil.

Shell's Alexia is specifically designed to guarantee extraordinary piston cleanliness and excellent neutralisation performance. No problems have been reported, either in laboratory testing or in practical operation, from mixing Shell Alexia grades.

ENGINE OILS

Marine diesel engine oils are in general miscible and compatible with other engine oils designed for the same applications. This applies to crosshead diesel system oils, medium-speed engine oils and high-speed diesel engine oils. In particular, different grades of the Shell Marine families Shell Argina and Shell Gadinia are fully compatible and miscible with each other, for example, Shell Argina S3 40 is fully miscible and compatible with Shell Argina S4.

Because of the extraordinary cleaning properties of Shell Argina grades compared with competitors' products, increased automatic filter and purifier flushing may be seen after topping up a used competitor's oil with fresh Shell Argina: the Shell Argina is cleaning up the engine. Filter and purifier activity will be back to normal shortly.

OTHER MARINE LUBRICANTS

Small volumes of oil in compressors, gearboxes and small hydraulic systems should be renewed completely and filled up with unmixed fresh oil. In large hydraulic systems and critical applications, the oil should be renewed completely or compatibility tested before any mixing. Shell Marine technical services can carry out such tests. Manufacturers of critical hydraulic systems may insist on complete oil changes and not allow any mixing of products. Manuals should be checked before mixing.

SYNTHETICS

Mixing mineral oil with any type of synthetic lubricant is usually avoided. However, the risk is quite often overestimated. Only some synthetic base stocks such as polyglycols are incompatible with mineral oil; many others such as polyalphaolefins, diesters and synthesised hydrocarbons are compatible with mineral base oil.

However, even though such products may be mixed without causing severe technical problems, this is not recommended. It always has an impact on the performance level of the final product. The same applies to mixing different types of synthetic oil: synthetic lubricants are custom-made for very specific applications and their individual characteristics may be impaired if they are mixed with others.

TABLE 1: CAUSES AND EFFECTS OF LUBRICATING OIL INCOMPATIBILITY

VISIBLE SIGN	CAUSE	OCCURRENCE
■ Deposits at the bottom of the tank ■ Clogging of line filters with a greasy deposit ■ Stratification of the oil column in the sight glass	Incompatibility	Reaction of differing additives and/or materials such as galvanised pipes
■ Visible layering of tank contents ■ Light deposits at the bottom of the tank	Overloading of additives	When different oils with heavy additive loads mix
■ Foaming	Anti-foaming additive drop-out	When engine oils mix with turbine or gear oils

APPLICATION GUIDELINES

APPLICATION	REMARKS	RECOMMENDATIONS
Cross-head engine cylinder lubricants	Shell Marine' cylinder oil range Shell Alexia has been compatibility tested with all the current versions of comparable competitors' products and found to be miscible and compatible at all proportions.	The level of the cylinder oil daily tank should fall to 20% of maximum capacity before starting to add Shell Alexia. For vessels with only one cylinder oil storage tank, where possible, allow the level in the tank to fall to the minimum level consistent with safe operation of the vessel before filling it up with Shell Alexia.
Cross-head engine system lubricants	For a low-treat-rate product, the risk of incompatibility or additive dropout is low. For in-sump mixing, the circulating line filters may plug with greater frequency than normal or the purifier cleaning oil may experience greater levels of sludge build-up. This is normal and not a cause for concern; the new oil is cleaning the deposits from oil-wetted surfaces.	Wherever possible, reduce the contents of the storage tank to the minimum level consistent with safe operation of the vessel before filling it with Shell Melina S30. To minimise any adverse effects, limiting the amount of make-up feed to less than 10% of the total sump contents is advisable.

APPLICATION GUIDELINES (CONT.)

APPLICATION	REMARKS	RECOMMENDATIONS
Trunk piston engine lubricants	The real risks associated with adding Shell lubricants to competitors' products may be a result of the superior detergency of Shell products. When Shell lubricants are added to engines lubricated by a competitor's product, there is often an increase in insoluble contamination levels. This can range in severity from hardly noticeable to severe, and require increased cleaning of filters and purifiers.	Wherever possible, reduce the contents of the storage tank to the minimum level consistent with safe operation of the vessel before filling it with Shell Argina or Shell Gadinia. To minimise the in-sump mixing effects listed in the remarks column, limiting the amount of make-up feed to less than 10% of the total sump contents is advisable.
Turbine oils	Mixing of turbine oil with traces of engine oil may cause precipitation of the anti-foaming additive that is a regular ingredient of most turbine oil additive packs. If contamination has occurred, the effect may be visible as foam. This can seriously jeopardise the ability of the oil charge to maintain a viable oil film between sliding parts	There are no restrictions to mixing Shell Turbo T grades with competitors' grades. However, minimising mixing to below 80:20 is advisable for warranty reasons. For equipment such as turbochargers involving small volumes of product, a clean changeover at the time of the planned oil change is advisable. Some turbochargers may be using a synthetic polyalphaolefin- or ester-based product. When topping up with Shell oil, completely draining and flushing with new product before filling up to the required mark is advisable.
Hydraulic systems	Some hydraulic oils contain zinc-based anti-wear additives. These oils will harm components made of certain alloys containing metallic silver. For these, only hydraulic oil containing an ashless additive is applicable. It also follows that these two types of oils should not be mixed in systems that require advanced hydraulic oil made with ashless additive. Mixing of mineral oils with synthetic or water-based hydraulic oils is not recommended. Certain equipment manufacturers, such as Frank Mohn, state that mixing hydraulic oils from different manufacturers is inadvisable. In such cases, a full compatibility test of the planned mixture may be necessary.	There are normally no restrictions for in-tank mixing of mineral hydraulic oils of the same type. For small systems, avoid mixing oils of different manufacturers, drain completely and fill with Shell hydraulic oils at the planned changeover. For hydraulic systems containing large volumes of hydraulic fluid, a clean changeover to Shell oil may not be practical. In this case, send a representative sample of the current oil charge to the Shell RLA laboratory to ascertain its condition. Limit any instance of make-up oil addition to below 5%.
Other ancillary equipment (gears, compressors, etc.)	Avoid mixing mineral and synthetic oils. There is no restriction on in-tank mixing as long it is verified that the existing contents are in good condition.	For small capacity systems such as purifiers and air compressors, a clean changeover can be carried out during the planned oil change. Large critical gearboxes such as main drive reduction gears require careful consideration at the time of changeover. If a complete drain, flush and fill with a Shell product is not an option, limit make-up lubricants to less than 10% at a time and test the oil before and after the first instance of mixing to monitor the effects of the change.
Equipment using synthetic oils	Mixing of synthetic oils with mineral oils may result, at best, in degradation of the properties of the resultant mixture to the level of the mineral oil in the grade. In the worst case, this may even result in critical incompatibility of the mixture and equipment damage. Synthetic oils made from different base stocks should never be mixed. Please consult Shell Marine if the nature of the base stocks of specific oils is uncertain.	When changing from a mineral oil to a synthetic lubricant, ensure that the machine and system in question have been thoroughly drained, cleaned (if possible), flushed through with clean new synthetic lubricant and re-drained before filling with new synthetic lubricant. When changing air compressors over to synthetic lubricants, ensure that the oil and air filters used with the mineral oil are drained and cleaned. Renew the oil separator elements if fitted.
Grease	Mixing different greases, even those with similar thickener types, can sometimes lead to ineffective lubrication resulting in damage of the lubricated components. If not spotted soon enough, this may lead to equipment failure. These situations occur owing to chemical or structural interaction between the thickener or additive systems of the different greases. These would be classified as "incompatible". Signs of incompatibility come in various forms. Frequently, grease mixtures will exhibit a change in consistency relative to that of the individual pure greases. Incompatible greases may exhibit abnormal oil separation or bleeding at higher temperatures. Please refer to the Table 2 for compatibility of thickener types.	When changing from one type of grease to another, it is always best to clean and fully re-grease the bearings or thoroughly purge the old grease with the new grease. If this cannot be carried out, mitigating actions should focus on minimising the amount of the grease being displaced that remains in the application by increasing the lubrication frequency to facilitate timely purging of the old grease. Regular monitoring of temperature and vibration, and visual checks for leaks will prompt corrective actions if the mixture presents incompatibility in application.

TABLE 2: COMPATIBILITY MATRIX FOR THICKENERS USED IN VARIOUS TYPES OF GREASE

	ALUMINIUM COMPLEX	CALCIUM	CALCIUM COMPLEX	CLAY	LITHIUM	LITHIUM COMPLEX	POLYUREA
ALUMINIUM COMPLEX	–	●	●	●	●	●	●
CALCIUM	●	–	●	●	●	●	●
CALCIUM COMPLEX	●	●	–	●	●	●	●
CLAY	●	●	●	–	●	●	●
LITHIUM	●	●	●	●	–	●	●
LITHIUM COMPLEX	●	●	●	●	●	–	●
POLYUREA	●	●	●	●	●	●	–

● Compatible ● Borderline ● Incompatible

Shell Marine does not make any representation or promise that any recommendation or advice in this chart is complete, accurate or correct. The opinions and guidance in this chart are based on experience and observation, and not on any specific, controlled scientific or technical study. Shell Marine is providing this to the customers as a courtesy and in effort to assist in an effective, easy and economical transition to the use of Shell Marine' lubricants.

FIND OUT MORE

Contact your Shell Marine account manager to find out more or email to shellmarine-info@shell.com.

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