Solutions

Introduction

Metal alkyls can be supplied in solution in any concentration required. Transport containers used for the solutions are the same as those used for neat metal alkyls. The same safety precautions should be applied in handling solutions as in the handing of undiluted metal alkyls. In addition, special precautions may be necessary depending on the solvent.

Solvents

Saturated hydrocarbons such as hexane and heptane, aromatic hydrocarbons such as toluene or inert hydrocarbon mixtures such as white oils are suitable as solvents.

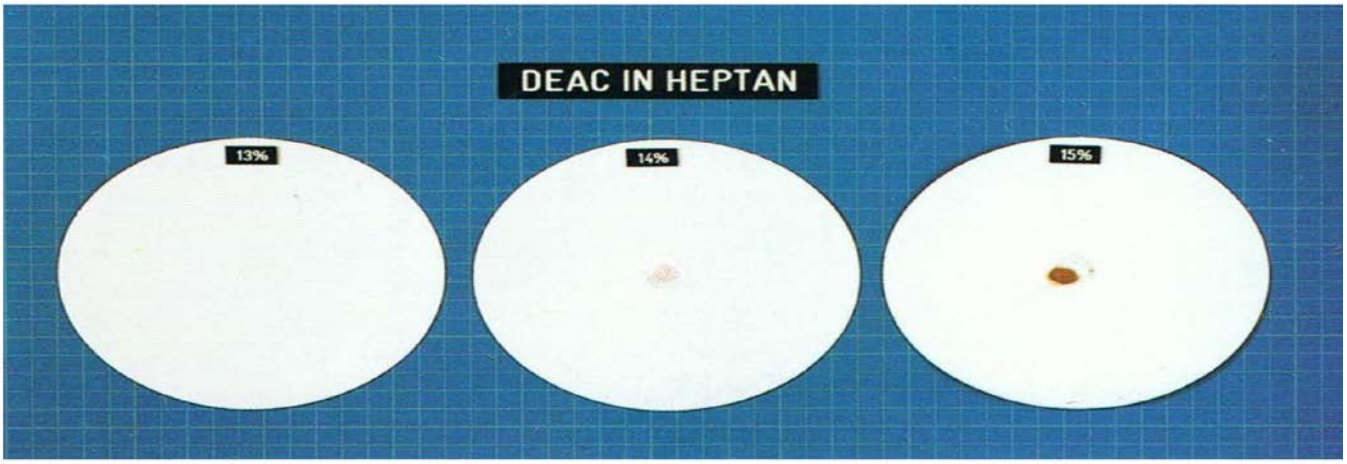
In order to prevent any loss in quality of metal alkyl solutions when blending, utmost care should be taken that the solvent contains no impurities, such as water, alcohols, ketones or olefins, which can react with metal alkyls. The maximum permissible water content of solvents used by Chemtura is given in our material specification.

A simple analytical method to determine whether solvent contains water or other reactive components is a metal alkyl test. In this test a certain quantity of metal alkyl is mixed with the solvent to be tested under nitrogen. Any rise in temperature, gas formation, or formation of solids indicates the presence of reactive compounds in the solvent.

Classification of Solutions

The self-ignition of metal alkyls can be changed by dilution with solvents. In order to determine the concentration up to which a solution of metal alkyls is to be classified as pyrophoric, an internationally valid test has been developed (UN recommendations on the Transport of Dangerous Goods).This test determines whether the substance chars or ignites a filter paper. A small quantity of the substance is placed on a dry filter paper under specified conditions. If ignition or charring of the filter paper occurs within 5 minutes after addition of the test substance, the mixture is deemed pyrophoric.

The table below shows the 'Pyrophoric Limit' of various metal alkyls in solution. This pyrophoric limit is not the same as the self-ignition limit. Self-igniting materials react with atmospheric oxygen or moisture with slight to moderate heat development. If such materials are exposed to the air over a long period of time (hours, days) and in large quantities, heating up to self-ignition can happen. This can also occur with a metal alkyl solution with concentration below the pyrophoric limit. Since 'self-ignition' and 'pyrophoric' have different meanings the transport classification of self-igniting substances includes both pyrophoric and self-heating materials.



Filter paper test for determination of pyrophoric lim (NPL = non-pyrophoric limit); NPL of DEAC in heptane is 13%

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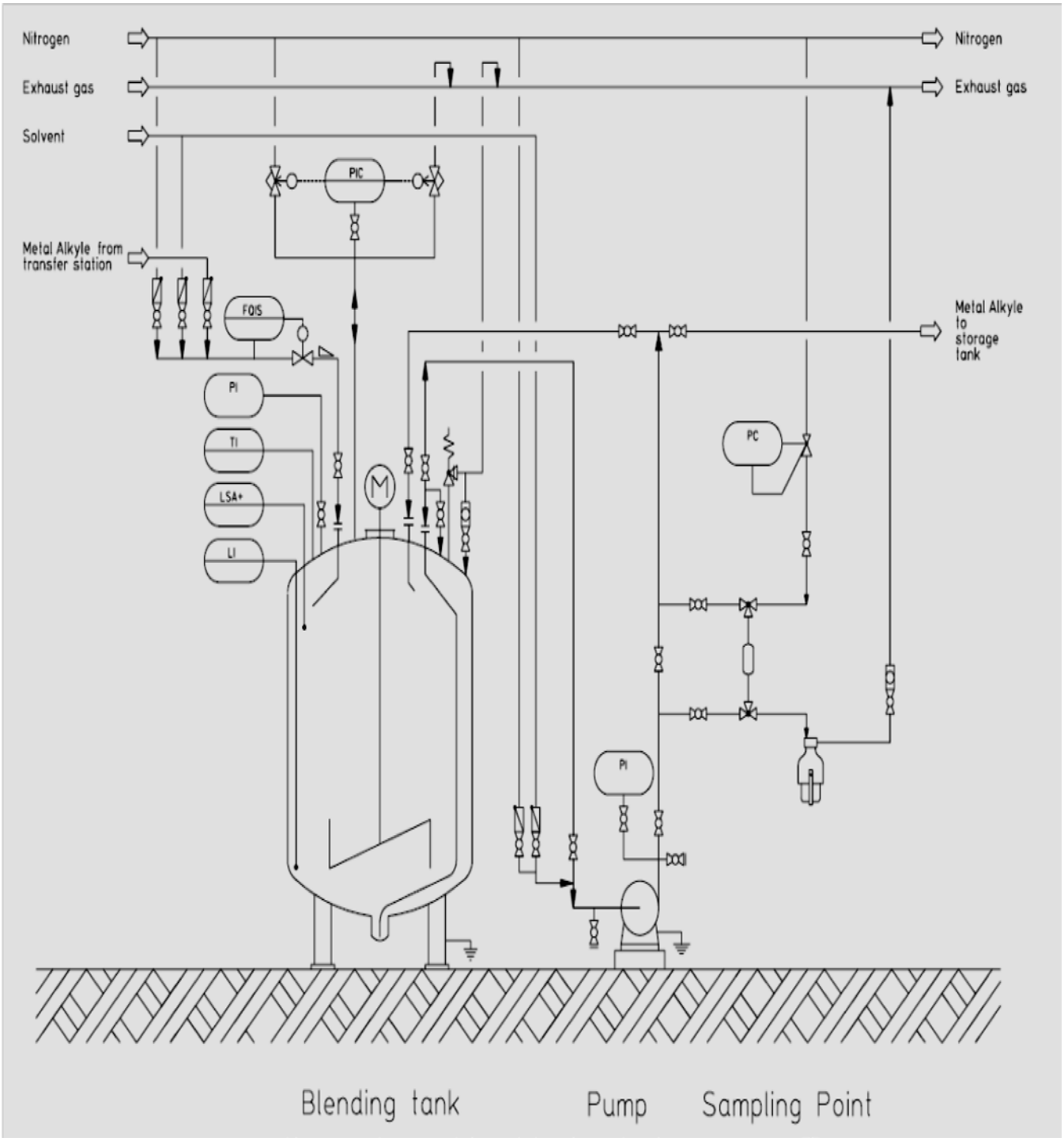
Solution blending is usually carried out as a batch process. The diagram below shows a blending station with a stirrer in a metal alky blending tank. In addition to the procedure to discharge a container (see 'Directions for the Transfer of Metal Alkyls from the Container') the following steps are necessary:

1. Add the required quantity of solvent to the blending tank via the volume flow meter FQIS.
2. Start up the stirrer.
3. Connect the container and discharge to the blending tank.
4. Add the metal alkyl and homogenize the solution by stirring.
5. Take a sample and analyze the solution. The solution concentration can be determined from the metal content. A small amount of metal alkyl or solvent can be added in order to adjust the required concentration.


Nitrogen
Exhaust gas
Solvent
Metal Alkyle from transfer station
PIC
FQIS
PI
TI
LSA+
LI
M
PC
PI
Nitrogen
Exhaust gas
Metal Alkyle to storage tank
Blending tank
Pump
Sampling Point

Name	Abbreviation	Heptane [%(w/w)]
Trimethylaluminum	TMA	14
Triethylaluminum	TEA	12
Tributylaluminum	TBA	27
Triisobutylaluminum	TIBA	25
Trihexylaluminum	THA	49
Trioctylaluminum	TOA	61
Isoprenylaluminum	IPRA	40[2)3)]
Diethylaluminum hydride	DEAH	13
Diisobutylaluminum hydride	DIBAH	21
Dimethylaluminum chloride	DMAC	14
Diethylaluminum chloride	DEAC	13
Diisobutylaluminum chloride	DIBAC	20
Diethylaluminum iodide	DEAI	27
Diethylaluminum ethoxide	DEALOX	26
Methylaluminum sesquichloride	MASC	15
Ethylaluminum sesquichloride	EASC	15
Ethylaluminum dichloride	EADC	29
Isobutylaluminum dichloride	IBADIC	28

1) by paper test according to UN recommendations on test and classification
2) Test modified since the surface becomes passive through crust formation
3) In hexane