

POLYOL BLENDS

The invention is concerned with a method of preparing a blend of polyols. Polyols, in particular polyether polyols or polyester polyols, are used in the manufacture of polyurethane articles. Usually a polyol producer manufactures a substantial number of different polyols having a range of characteristics such as functionality, hydroxyl value, nitrogen content, aromaticity and viscosity. This is particularly the case for so-called rigid polyols which are used in the manufacture of rigid polyurethane foam where the wide variety of applications requires an extensive range of foam properties and hence a significant number of different polyol grades. Consequently the polyol producer has to invest in a large number of storage vessels. The manufacturing operation can be simplified by producing a limited number of base polyol grades from which a larger number of commercial grades can be prepared by blending. However, this does not in itself overcome the storage problem in view of the need to store those blended polyol grades in addition to the base polyol grades.

The Applicants have now found that this problem may be overcome by preparing a polyol blend ready for transportation, which comprises withdrawing from their respective storage tanks a plurality of streams of different base polyols, continuously and simultaneously feeding said streams of base polyols in a predetermined ratio into a blender, and continuously discharging the resulting polyol blend into a transporter tank. This blending process thus makes it possible to produce from a small number of properly selected base polyols an extensive variety of (blended) polyols which supply all

the different customer requirements, not only in respect of OH values and functionality, but also matching the criteria for their polyurethane process and polyurethane end product.

Although continuous mixing/discharge of various liquids is known, this technique has not been applied hitherto by polyol manufacturers. The main advantage of the invention is that the polyol manufacturer has to invest in storage facilities only for the limited number of base polyol grades, plus in-line mixing equipment - which is smaller and easier to clean than batch mixing equipment. Moreover, the utilisation of in-line blending makes it economically practicable to produce any desired quantity of a specific blend; if the blend were produced by batch mixing, it would be technically difficult to produce very small quantities (effectively "tailor-made" product grades), whilst large quantities would require either large volume mixers or production via several, successive batch blendings (requiring the storage of successive batches). Also, the inherent flexibility of the blending concept makes it possible to provide new polyol grades simply by modifying the selection of base polyol and/or their blending ratios.

The mixing system used to blend the base polyols should be 'in-line' (i.e. continuous rather than batch), and comprises multiple feed lines to one or more mixing areas and a discharge nozzle. In its simplest form it can be simply a mixing space within a pipe.

The process may be carried out in conventional equipment utilised for blending different feedstreams, with the addition of control means and switching mechanism by which it is possible to shut down a feedstream and switch to another feedstream when a different polyol grade is to be prepared, or to change

THIS SHEET HAS BEEN
REPLACED

the relative feed ratios of the base polyols utilised from the predetermined rate required for one polyol grade to a different predetermined rate as required for a different polyol grade.

Clearly, the choice of the individual, different base polyols is an important factor in the ability to produce the desired range of properties through blending of different ratios/components. In general, it has been found that several different base polyols are usually required; naturally, it is technically simpler and economically preferable to operate with the minimum necessary range of base polyols, and it has been found that no more than 6, often only 3 or 4, are usually sufficient to produce the entire range of commercial polyol grades.

The different base polyols are suitably selected to encompass a wide range of hydroxyl values and functionalities. Preferably the base polyols encompass hydroxyl values in the range of from 200 to 700; functionalities in the range of from 2.0 to 5.5; and include at least one aromatic polyol. Suitably the individual different base polyols comprise:- a) at least two with functionality below 3.5, one having an OH value above 500 and another having an OH value less than 300; b) at least one having a functionality of at least 4.5 and OH value in the range of from 200 to 600; c) at least one having an aromatic content of at least 15%; and d) at least one having a nitrogen content of at least 2.5% m/m. Naturally, it may be possible to combine requirements c) and/or d) with a) and/or b) in a single base polymer.

Additional flexibility in the final blended polyol can be obtained by feeding into the blender an additional stream of a diol or triol, such as glycerol or trimethylol propane.

This Sheet Has Been Replaced



The following examples serve to illustrate the types of base polyol that can serve the needs of the present process, and the range of polyol blends corresponding to commercial grades that can be generated by appropriate blending of those base polyols.

Set of base polyols

Base Polyol	Initiator/oxide	OH-value (mg KOH/g)	Functionality (eq/mole)
BP-A	Glycerol/PO	250	3.0
BP-B	Glycerol/PO	570	3.0
BP-C	Sorbitol/H ₂ O//PO	475	5.3
BP-D *	EDA/PO	630	4.0

(PO = propylene oxide; EDA = ethylene diamine);
 * having a nitrogen content of at least 2.5% m/m.

Commercial polyol grades whose properties can be matched by blend of base polyols

Commercial grade equivalent	Ratio of Base polyols (% by volume)				
	BP-A	BP-B	BP-C	BP-D	Glycerol
CG-1	-	17.7	43.2	36.3	2.8
CG-2	13.3	29.2	19.8	37.8	-
CG-3	-	21.9	76.3	-	1.8
CG-4	11.0	9.0	70.7	9.4	-
CG-5	9.8	27.9	60.6	-	1.7

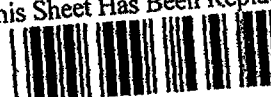
Each of these CG Blends was evaluated in standard foam formulations and foaming conditions appropriate to the end application (eg. lamination or pipe cladding), and the quality of resulting foams matched those from the corresponding commercial grade.



TS 6536

C L A I M S

1. Method of preparing a polyol blend ready for transportation, which comprises withdrawing from their respective storage tanks a plurality of streams of different base polyols, continuously and simultaneously feeding said streams of base polyols in a predetermined ratio into a blender, and continuously discharging the resulting polyol blend into a transporter tank.
2. Method as claimed in claim 1, wherein the base polyols fed to the blender are selected from up to 6 different base polyols.
3. Method as claimed in claim 1 or claim 2, wherein the different base polyols are selected to encompass a wide range of hydroxy values and functionalities.
4. Method as claimed in claim 3, wherein the different base polyols encompass hydroxyl values in the range of from 200 to 700; functionalities in the range of from 2.0 to 5.5; and include at least one aromatic polyol.
5. Method as claimed in claim 4, wherein the different base polyols comprise:- at least two with functionality below 3.5, one having an OH value above 500 and another having an OH value less than 300; at least one having a functionality of at least 4.5 and an OH value in the range of from 200 to 600; at least one having an aromatic content of at least 15%; and at least one having a nitrogen content of at least 2.5% m/m.
6. Method as claimed in any one of claims 1 to 5, wherein a stream of aliphatic diol or triol is fed into the blender simultaneously with the streams of base polyols.
7. Method as claimed in claim 6, wherein the aliphatic diol or triol is glycerol.





- 6 -

8. Polyol blends whenever produced by a process as claimed in any one of claims 1 to 7.
9. Use of a polyol blend produced by a method as claimed in any one of claims 1 to 7 in the production of polyurethane foams.