

# Impregum™ Soft

Polyether Tray Impression Material

# Impregum™ Soft Quick Step

Polyether Tray Impression Material



## Technical Data Sheet



### Indications

#### Product Indications

- Precision impressions of inlay, onlay, veneer, crown and bridge preparations
- Fixation and implant impressions
- Edentulous impression

### Introduction

Introduced in the mid-1960s, polyether materials have since become indispensable for impression taking. The precision provided by these materials is well respected. At the heart of polyether impression materials is a series of key attributes — intrinsic hydrophilicity, unique rheology, as well as a snap-setting behavior. Through a continuous innovation process, polyether materials have become significantly easier to handle. The Impregum™ Penta™ Soft polyether product line introduced in 2000 achieved major improvements with respect to removal and taste.

With the launch of the Impregum™ Penta™ Soft Quick Step polyether line in 2004, 3M ESPE answered the market demand for a fast-setting polyether impression material especially suited for one and two unit cases.

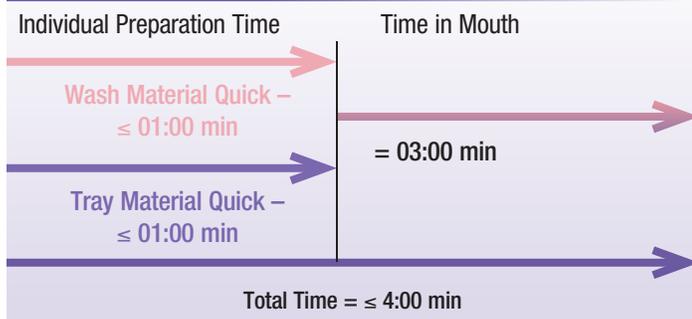
Now, in 2008, we supplement our portfolio with a new generation of type 2 tray material, conveniently delivered by hand dispenser. Impregum™ Soft polyether tray materials can either be used in the 1-step impression technique together with hand dispensed wash materials or alternatively in the monophasic technique.

## Choice of Working and Setting Times with Impregum™ Soft Tray Materials

### Regular setting version:



### Quick setting version:



Impregum™ Soft Quick Step polyether products from 3M ESPE have a maximum working time of 1 minute and a setting time in the mouth of 3 minutes.

## Composition

The following table provides an overview of the qualitative composition of the new hand-dispensed 3M ESPE polyether materials:

Base	Catalyst
Polyether macromonomer	Initiator (initiates cationic ring-opening polymerisation)
Fillers	Fillers
Plasticizers	Plasticizers
Pigments	
Peppermint flavorings	
Triglycerides	
Stabilizer	
Accelerator*	

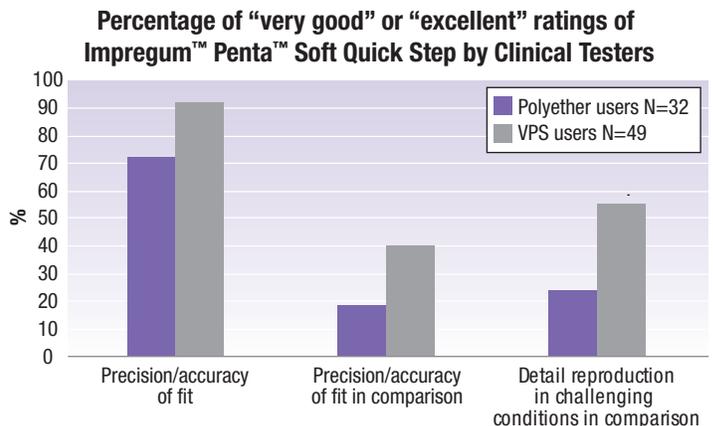
\* fast setting product only

In comparison to Impregum™ Penta™ Soft and Impregum™ Penta™ Soft Quick Step polyether material, Impregum Soft tray materials differ primarily in the type of plasticizer used in the base paste. The effective formula which ensures easier removal and better taste than earlier generations of polyether remains the same. For improved aging stability of the set impression a stabilizer has been added.

## Recent Clinical Results with Impregum™ Penta™ Soft Polyether Impression Materials

A 3M ESPE polyether impression material was evaluated by dentists who currently use polyether (n=32) and dentists who currently use a commercially available vinyl polysiloxane (VPS, n=49) (Langdon S., Klettke T., Coalwell B. "Performance of a Fast Setting Polyether Impression Material", *IADR*, 2006 #669). The material properties of the polyether material (Impregum Penta Soft Quick Step, 3M ESPE) were rated on a scale from 1-5. The dentists evaluated the precision and accuracy of fit of the final restoration (Prec/Acc fit), precision and accuracy of fit of final restorations compared to results with their current material (Prec/Acc fit comp), and detail reproduction of final impression in challenging conditions (e.g. in presence of blood or saliva) compared to their current material. Percentages represent those who responded with either very good (rating 4) or excellent (rating 5), as displayed below.

Dentists that currently use VPS were very favorable towards Impregum Penta Soft Quick Step fast setting polyether impression material: they indicated that precision and accuracy of fit of the restorations were improved compared to their current material. Additionally, VPS users indicated that the detail reproduction of Impregum Penta Soft Quick Step impressions in the presence of blood/saliva was improved compared to their current material.



3M ESPE internal lab tests

Another recent study investigated the precision of a 3M ESPE polyether compared to Aquasil Ultra (Dentsply) in a randomized clinical trial. In this study the polyether material showed a significantly higher precision.<sup>1</sup>

In an investigation with a dental practice management group, Pacific Dental Services, Inc. (PDS) based in Huntington Beach, CA, 3M ESPE polyether impression materials were evaluated. The project's objective was to improve PDS's business processes that increase productivity, optimize chair time and reduce stress in the dental office. Crown adjustments were decreased significantly which resulted in decreased chair time, more patient comfort and a potential increase in production for PDS-affiliated offices of \$48,000 per month.<sup>2</sup>

## Clinically Relevant Characteristics

Impression materials have to meet exacting requirements in order to reproduce preparations in the moist environment within the mouth with precision and true to dimension.

The key material properties include:

- Hydrophilic behavior prior to setting
- Excellent flow behavior throughout the entire working time
- Clinically comfortable setting behavior
- Dimensional accuracy

These parameters will be discussed in the following sections.

### I. Hydrophilicity — Clinically Relevant During Syringing

The hydrophilicity of an impression material contributes significantly to the precision and reproduction of detail. Most of the materials available on the market today are labeled hydrophilic. However, they are subject to considerable, highly relevant clinical differences:

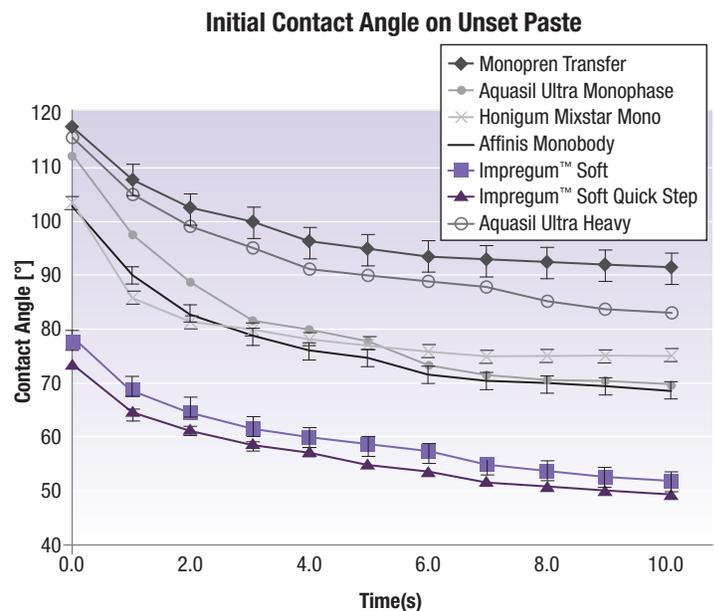
3M ESPE polyether materials are hydrophilic by the nature of their chemical makeup. This ensures that from the time the polyether is mixed until it sets it is characterized by its tendency to favor moist surfaces, such as a preparation, and achieve precise reproductions. This is also known as intrinsic hydrophilicity.

By contrast, silicone impression materials, which are intrinsically hydrophobic, have to be made hydrophilic by adding surfactants, which are surface-active additives. This has several disadvantages. For one, when an impression material with surfactant comes in contact with moisture, the surfactant has to "migrate" to the surface. This prevents the hydrophilicity from fully developing at the very first contact with moisture.

However, hydrophilicity is necessary at this first contact when the material flows, e.g. while syringing or when seating the tray, to ensure clinical success.

A frequently used method to determine the hydrophilicity is the contact angle measurement. This is very easy to do and widely used on impression materials after they have set. But — is a measurement of the set material really clinically relevant? As outlined before, hydrophilicity is most important during syringing and seating the tray. Therefore in recent studies<sup>3,4,5,6</sup> contact angles were analyzed on impression materials in the unset stage, i.e. during the working time. 3M ESPE polyether impression materials were found to be more hydrophilic than VPS regardless whether water or saliva was used as test liquid.<sup>7</sup>

The latest results with tray materials are illustrated in the following diagram:



3M ESPE internal lab tests

During the working time at 45 seconds after start of mixing, a drop of water was placed on the impression material, and the contact angle of the drop was measured. The data is shown in one second increments.

For the entire observation period, the Impregum™ Soft and Impregum Soft quick step polyether tray materials from 3M ESPE exhibited significantly lower contact angles, and thus significantly higher hydrophilicity in the unset stage than all silicone materials that were measured. It is important to point out the initial hydrophilicity — the hydrophilicity at 0 seconds (first contact of water with material). At this point in time the initial contact angle of the polyether materials is lower than those obtained for VPS materials. The results clearly reflect the chemical

differences and support recent studies by Mondon, Rupp, Kugel et al.<sup>1,2,3,4</sup> and Walker et al.<sup>8</sup> This might result into better clinical performance in the presence of moisture.

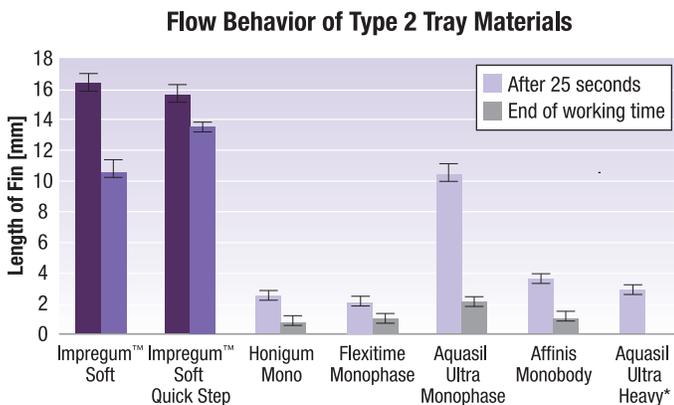
## II. Flow Properties — Clinically Relevant During Entire Working Time

In addition to hydrophilicity, impression materials also require special rheological properties in order to ensure optimal wetting of the preparation surface areas after syringing around the preparations. The syringed impression material is pushed into the critical areas by the compression exerted by the tray material when the tray is inserted. With the exception of the two step putty wash technique, the resulting insertion pressure is very low, especially in case of a deep sulcus or undercut areas, or when using techniques such as the dual arch technique.

For a study to be clinically relevant, the point in time chosen for the analysis of the flow properties has to be considered. For example, a light or medium body material is syringed to the preparation at the beginning of the working time. However it might be at the end of it's working time when the tray is inserted and the wash material is finally distributed around the preparation. A sophisticated method for analyzing flow properties is the Shark Fin test<sup>9,10</sup> which also has been used by *The Dental Advisor* and in a modified form by REALITY to differentiate the flow of dental impression materials.<sup>11</sup> Recent studies have shown the excellent flowability of 3M ESPE polyether impression materials.<sup>12,13</sup> The shark fin test was also applied in the presence of moisture. 3M ESPE polyether impression materials were shown to have excellent flow results.<sup>14</sup>

Two test series were carried out for each material:

Compression was applied 25 seconds after mixing begins and at the end of the working time indicated by the manufacturer. The results of the study involving seven type 2 precision impression materials are illustrated in the following graph:

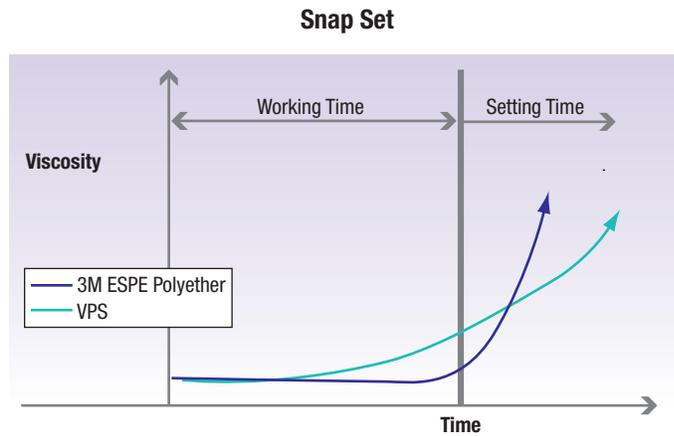


3M ESPE internal lab tests

\* At the end of working time, no shark fin could be measured

Both 3M ESPE polyether impression materials exhibit significantly better flow properties than the VPS materials, at the beginning as well as at the end of the working time. It is also important to note that the flow properties of the 3M ESPE polyether materials remain much more constant throughout the working period<sup>15,16,17</sup> giving the dentist extra security.

The explanation is the snap-set behavior, which is typical for polyether impression materials. They show a characteristic profile which is particularly suitable for clinical use. This is illustrated in the following graph:



The sharp increase in viscosity of 3M ESPE polyether materials after the end of the working time is called snap set. Other impression materials have a more continuous increase in viscosity already during the working time. This might lead to distortions of the resulting impression not recognizable to the naked eye.

## III. Reproduction of Detail — Clinically Relevant Conditions

Numerous studies were able to demonstrate that 3M ESPE polyether materials achieve a particularly good reproduction of details, especially under clinically relevant moist conditions.<sup>18,19,20,21</sup>

Not only in clinical dentistry, but also in scientific research inside and outside the dental field, polyether is usually preferred over silicone to produce models with optimal reproduction of detail.<sup>20,21</sup> For instance, polyether materials are most often used for the replica technique.<sup>22,23,24,25</sup> Alternatively, SEM evaluations can be done by investigating polyether impressions directly.<sup>26</sup>

## Physical and Technical Data

(ISO 4823:2000, 3M ESPE internal lab tests)

Property	Impregum™ Soft Quick Step B #304551 C #304560	Impregum™ Soft B #304552 C #304560	Impregum™ Penta™ Soft Quick Step B #176018 C #174222	Impregum™ Penta™ Soft B #149466 C #150215	Aquasil Ultra Monophase #070815	Aquasil Ultra Heavy #060104
Consistency	Type II	Type II	Type II	Type II	Type II	Type II
Reproduction of detail 20 µm line visible	fulfilled	fulfilled	fulfilled	fulfilled	fulfilled	fulfilled
Linear dimensional change after 24 hrs [%]	-0.3	-0.2	-0.3	-0.4	-0.3	-0.3
Compatibility with dental gypsum 50 µm line visible	fulfilled	fulfilled	fulfilled	fulfilled	fulfilled	fulfilled
Recovery from deformation [%]	> 98.0	> 98.0	> 98.0	>98.0	> 98.0	> 98.0
Deformation under pressure [%]	2.9	2.7	2.3	5.2	4.5	3.4

## Further Material Characteristics

(DIN 53504 and DIN 53505, 3M ESPE internal lab tests)

Property	Impregum™ Soft Quick Step B #304551 C #304560	Impregum™ Soft B #304552 C #304560	Impregum™ Penta™ Soft Quick Step B #287745 C #278729	Impregum™ Penta™ Soft B #278983 C #278729	Aquasil Ultra Monophase #070815	Aquasil Ultra Heavy #060104
Shore A after 24 hrs (DIN 53505)	57	56	56	50	61	65
Tensile strength [MPa]	2.4 ± 0.1	2.4 ± 0.2	2.3 ± 0.2	1.8 ± 0.1	4.7 ± 0.2	4.9 ± 0.3
Elongation [%]	349 ± 29	339 ± 31	340 ± 53	268 ± 23	204 ± 15	166 ± 12
Toughness [J]	1.12 ± 0.14	1.07 ± 0.15	1.03 ± 0.23	0.59 ± 0.08	1.05 ± 0.13	0.85 ± 0.12

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