

## Client Case Study “Teeth Whitening Strips”

### Background

A major consumer products company asked GEN3 for help in developing a new method for whitening teeth. This market had been dominated by a technology that was both inconvenient and had potential health impacts. Specifically, it involved the use of molded plastic inserts or cups that were wetted with a bleaching agent and inserted into the mouth to temporarily encapsulate the teeth. Users would typically use this treatment overnight because the process took several hours and it was difficult to talk with the inserts in place.

In addition to this inconvenience, the procedure was potentially harmful for consumers since the chemical used did not just whiten the teeth, but it could leak out of the inserts, passing into the mouth and further into the body, **irritating and damaging gums and other soft tissues**. To reduce this risk, the bleaching solution had been significantly diluted, a compromise that reduced the effectiveness and created the need for long exposure.

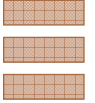
### The Solution

GEN3 used several techniques from its GEN3 Innovation Discipline (G3:ID) suite of tools to develop a solution. These included Trimming and Feature Transfer, Su-Field Analysis, resolution of physical contradictions, and Function Oriented Search.

The first step toward a better product was to “Trim” or remove the inserts themselves from the functional model, leaving a new model consisting only of the teeth, the whitening chemical, and the soft tissues of the mouth and digestive tract.

A Substance-Field (Su-Field) analysis created for this system clearly showed the harmful effects of the bleaching agent under these circumstances and strongly demonstrated the benefits of inserting another substance into the mix. This substance needed to block the action of the bleach on the soft tissues, but should not have the bulk and expense of the molded inserts.

GEN3 proposed that a thin film could potentially satisfy this need, but it would ideally include certain additional properties such as self-adhesion, low cost and compatibility with the bleach.



Meanwhile, GEN3 also needed to address a physical contradiction if they wanted to produce a significantly improved product: the whitening agent needed to be strong and concentrated to effectively whiten the teeth in a short period of time and furthermore, the whitening agent needed to be weak to avoid damage to the soft tissues.

Resolution of this conflict, instead of compromise as was done before, seemed possible based on separation of the requirements in space: the agent needed to be strong immediately adjacent to the teeth while it needed to be weak everywhere else. If the agent could effectively be contained behind the plastic film proposed above, the contradiction could be resolved.

With these needs in mind, GEN3 conducted a Function Oriented Search (FOS) for a thin, self-adhesive film with concentrated chemicals isolated on one side of the film. The result of that search, and the inspiration for the final product, was the idea of a patch similar to the ones used to dose nicotine to people trying to stop smoking.

GEN3 adopted this idea and proposed a **thin flexible film** as a chemical barrier with this film also containing a very reactive chemical reagent. Narrow strips of this film, **glued to the teeth**, would gradually release a whitening agent acting upon the teeth enamel.

This design effectively mitigates the chemical agent from spreading beyond the boundaries of the target zone. If the film itself could be white or transparent, it could be worn in public without concern for its visual appearance. This solution met all of the design objectives. It was safe, effective, convenient and it could be produced very inexpensively.

The idea was transferred to the client for further development and marketing, eventually appearing on the market. In the client's view, this innovation was **one of the most successful product introductions in the entire history of the company**.