

HAZARD LABELS OF DANGEROUS PRODUCTS: ARE THEY PASSING THE RISK MESSAGE?

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Introduction

The expansion of chemical industry is increasing the circulation of dangerous goods in Brazil. Daily, hundreds of trucks circulate carrying acids, inflammable radio actives and explosive products. Some of them may cause cancer, but others can simply provoke from skin irritation to physical deformation.

Most of this dangerous goods goes to roads that are, frequently, in bad conditions of traveling. This issue associated to factors like: maintenance of the vehicle, types of package, and drivers capacitating make turn activity a potentially generator of accidents that involves humans and also environmental damage.

Recognize the vehicles that carry a dangerous good can be basic in an emergency situation, because recognizing in advance a dangerous situation is a responsible attitude of persons that want to protect themselves.

The vehicles that carry dangerous good present two types of signaling: the risk label and the safety panel, as shown in figure 1. The safety panel aims to facilitate the recognition of the carried products at a distance, by showing the product's risk number, according to the legislation (ABNT - project NBR 8286:1999) and the risk label intends to allow faster identification of the danger that the material presents, from the general appearance of the symbols (form and color) (ABNT project NBR 7500:1999), like shown at figure 2.

It is a responsibility of the transporter to affix the risk label, the safety panel and to decode the information presented for these signals. It is a right of the drivers and all participant of the road environment to understand them.



Figure 1 – Truck with the panel of security and the label of risk respectively.

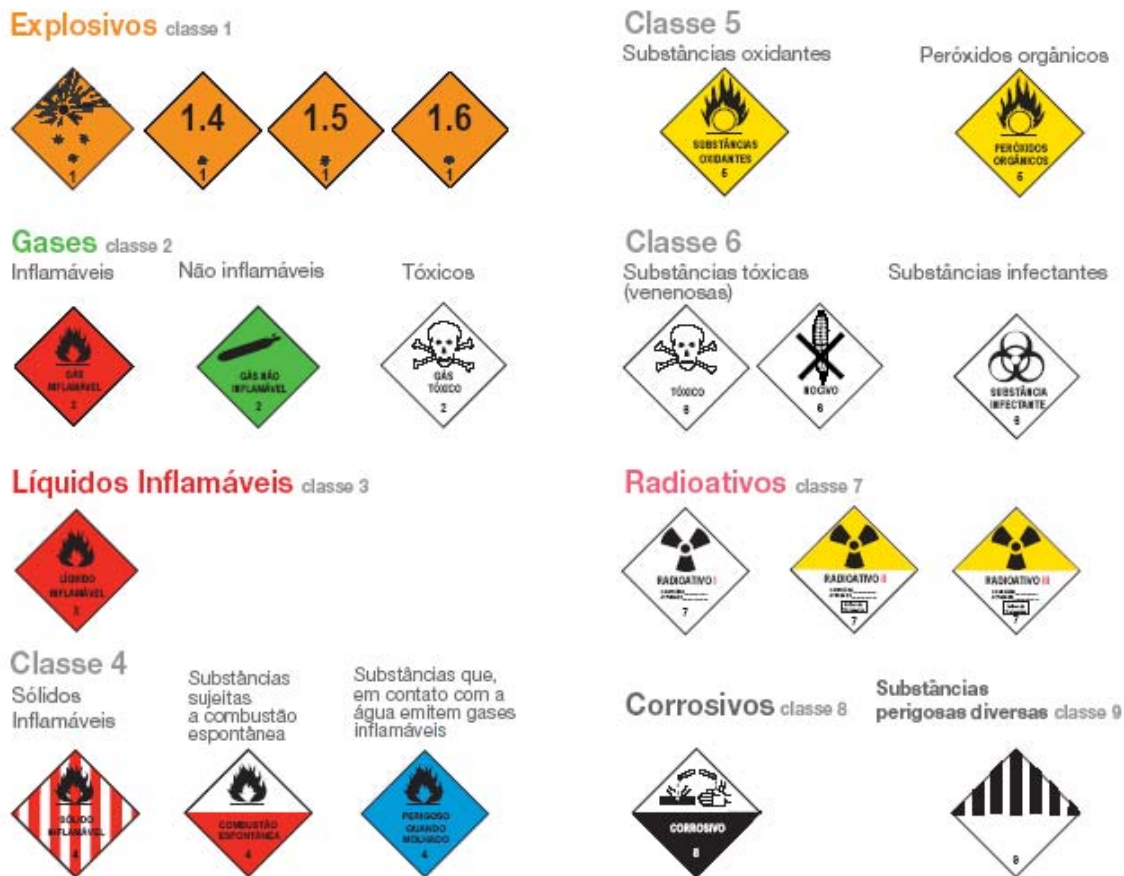


Figure 2 - Labels of risk grouped according to classes established for the ABNT.

Issues

The lacks of knowledge from the traffic members aggravate this reality. The ignorance of the drivers and the other people that usually come close to the accident to see or try to help can muddle all the rescue operation.

Accidents with dangerous load grow 136.3% in the Vale do Paraíba (a region in southeast of the country). A study also points out that the in first four months of 2001 it was occurred 12 accidents more than in the whole year of 2000 with involving dangerous goods. (NTCNet, 2005).

The drivers that see an accident place must inform the authorities some data that can identify the vehicles involved. It's known that the driver never learns how to interpret this kind of signalization during his driver's license course. So, how can we expect from this individual this kind of information if he or she doesn't count on any kind of previous knowledge about these signs? Or, is this signalization so ease to understand that is able to tell what these products are and how you must act that a previous course is unnecessary?

Jose Tardivo, representing the Brazilian Association of Liquid and Dangerous Goods (ABTLP) say "The law of dangerous goods of 1983 foresaw courses for the formation and qualification of drivers, but this was only regulated in 1985, even so either this factor that cause more accidents", and stands out and praises the effort of programs of entities as the Abiquim, (with the Responsible Performance Program), the Associquim, (with Responsible Distribution Program), and isolated initiatives of transporters and shippers in keeping constant training of its employees. "An entrepreneur of the sector said me that he invested US\$ 200.000 in training and, with this, prevented 1 million in repairing of damages expenditures", affirmed.

Some Researches

The conceptual stages of Source, Channel, and Receiver are taken from Communication Theory (Lasswell, 1948; Shannon and Weaver, 1949). According to Wogalter (2004) the Receiver stage is broken down further into several human information processing sub-stages: attention switch and maintenance; comprehension; beliefs and attitudes and motivation to carry out the compliance behavior.

Each stage of this model can allow information "flow through" to the next stage, or it can produce a bottleneck which blocks the flow before the process ends in the desired behavioral compliance. While the process might not go all the way to behavioral compliance, it still might effectively influence earlier processing stages. For example, information can positively influence comprehension about the hazard yet not produce an effect on beliefs and attitudes or affect motivation or change behavior. Such a warning cannot be said to be totally "ineffective" as it does produce better understanding. However, it is ineffective in the sense that it does not necessarily produce the desired safe behavior. If a source does not issue a warning, no information will be transmitted through a channel stage and thus nothing will be communicated to the receiver.

Differences in meaning construction introduced by culture will influence how individuals process information related to a technology or system. It is proposed that individuals apply a cultural worldview (or cognitive framework) to process information related to a hazard or potential hazard and make decisions to act or behave in precautionary manner on the basis of the dominant cultural worldview (Smith-Jackson and Wogalter, 2000).

According to Ramos (1997) a project for data collect on the transport of dangerous materials in highways was applied by the CETREM/SUL in 1993. The data of dangerous materials had been collected during the period 24-hour in each rank for traffic, in both the directions.

The data indicate that the majority of the schedules of bigger traffic had occurred between the 6:00 of the morning and to the 6:00 of the afternoon.

During the sampling, all the trucks that had passed for the ranks (in any direction) had been inspected. Each inspection included the identification of the type of load, weight and/or total amount, type of container, number of containers, and origin and destination (state). For identified loads as dangerous (from its on-board documents), the class of danger, number of the ONU/EUA had been determined.

Still, by means of a physical inspection of the truck, its content and documents of embarkment, verification of credentials, and brief questionings with the drivers, had determined the infringement. These infringements had included:

- Training and qualifications of the driver,
- Signaling,
- Documentation of embarkment, and
- Conditions of the vehicle and the equipment.

To complete the inspection, the driver answered to a questionnaire. In the work developed for the CETREM/SUL there is an evidenced that the transporters constitute an important factor in the result, therefore they in such a way present great concern with the security of the load and of its employees, aiming at with this not only the reduction of costs as also to improve the quality of its services.

MONT'ALVÃO et BENCHIMOL (2003) carried two experiments at LEUI/ PUC-Rio. The first, to evaluate the product comprehension level related to the pictogram used. The second one compared the different types of warnings to determined comprehension and accordance.

These authors point out the investigation conducted by Davies et al. (1998), in which were evaluated thirteen pictograms, some of them were risk labels utilized in the transport of dangerous goods, more specifically, the class 3 (flammable), class 5 (oxidizer) and class 8 (corrosive).

Once determined the sample, the subjects was questioned about the meaning of the pictograms, the nature of danger and the actions of security associated to the message that intended transmit. The results are showed in Table 1, below.

Table 1: Results of Davies et al. (1998) in MONT'ALVÃO et BENCHIMOL (2003)

Hazard Category	Label	Product	% right answer	% wrong answer
3		Flammable	85	5
5		Oxidizer	2	41
8		Corrosive	29	9

So, MONT'ALVÃO et BENCHIMOL (2003) interviewed with Visual Arts (Semiotics) specialists, in order to understand the criteria and parameters that should be considered when creating a pictogram. Also another interviews were performed with:

- Private car drivers to know their evaluation, opinions, and suggestions regarding interpretation and suitability of hazard labels;
- Associates responsible for training in transportation companies (via highways) of hazardous products to know the training criteria and emergency procedures provided to drivers of vehicles loaded with hazardous products.

In addition to that, questionnaires and evaluation scales were performed with the following users: private car drivers, different load vehicles drivers, hazardous load vehicle drivers, and motorcyclists.

The specialists suggested, then, that when qualifying drivers, there is the need to clarify the meaning of each of the used symbols. They suggested creating an educational booklet, as the symbol decoding is an important procedure not only to drivers, motorcyclists, and cyclists, but also pedestrians.

It was noticed that the fact that all population acknowledge the symbology used in hazard labels could benefit society as a whole, as the right procedures, in case of an accident, can save lives.

Following the suggestion that mentioned an educational booklet a second part of the research started. The objective of the educative booklet is to supply the user with visual luggage through the presentation of all the existing labels in a way that at emergency moment this user is capable to identify the product quickly in order to communicate the occurrence and the necessary information to the responsible agencies in the most fast and efficient way.

They had been searched diverse educative booklets that deal with diverse subjects through material search available printed matter and in the Internet.

It was identified there from the diverse elements that compose an educational booklet:

- There is a colored text;
- presence or absence of a human and also not human character;
- the information has been transferred through a story;
- presence of photos;
- and if presents colored or black and white illustrations.

Below some searched examples of booklet pages.



Figure 3 - Page that contains greater number of the observed data.

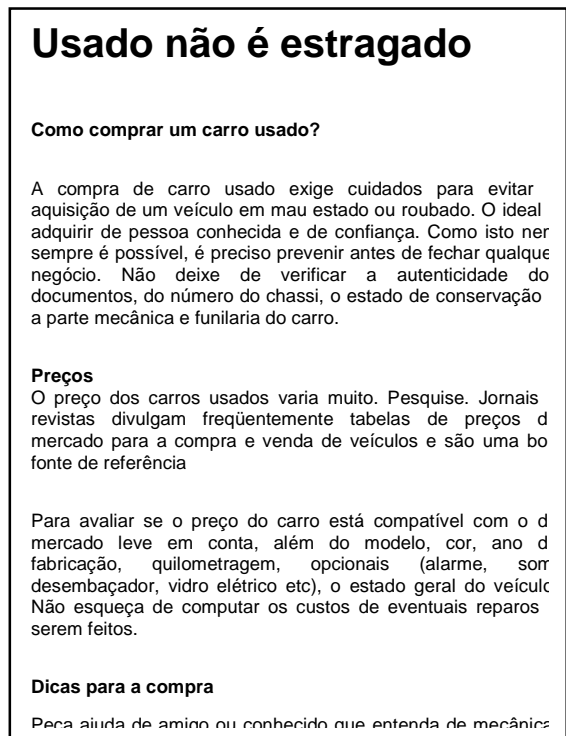


Figure 4 - Page that contains minor number of the observed data.

After this analysis a lot of questions were formulated and this reflection had been generated some guidelines about the visual and informational content of the booklets. The main focus was in the public of drivers, very diverse, both male and female and different social classes therefore the 18 years, and taking in consideration also the fact to be dealing with the delicate subject of the life risk.

It was made an interview with professionals of Design, Psychology, Education and Portuguese Formation and reached diverse considerations to adjust the educational booklet. From the answers of these professionals was possible to elaborate guidelines (recommendations) for the construction of the educational booklet.

The educational booklet presents the signs obeying an division into their classes and separated by different colors (that are the same as the majority of signs that compose a certain class). Those classes appear also with some illustrations of drivers sending important messages, examples of goods and other information about such products.

The final page of the booklet presents a "map" with all the labels together in order to present to the driver the visual of all the signs as a signalization system. The objective of the booklet is to give the visual support to the reader so that he can learn how the symbols look like and what they represent. So, it must work with emergency visual

information to be seen in the moment of the contact with accident or a risk situation with this kind of product. The other items that were elaborated were a garbage bag for the car and an adhesive for the panel that contains the most important information in those cases, the emergency telephone. This is the number of ABIQUIM – Brazilian Association of the Chemical Industry, agency that provides help in this kind of accidents in Brazil.

Some practical initiatives also are taken as the Department of Roads of Paraná (a state of Brazil) that approved the program of action and control of accidents with dangerous loads of the Viapar concessionaire, responsible for a stretch of 474 kilometers of highways in the State. The program has the objective to identify the type of accident, to isolate the area and to act in set with the authorities in the rescue of the victims and removal of the involved vehicles in accidents. When passing for one of the six tolling squares, the employee of the concessionaire identifies the trucks with dangerous goods. Its characteristics are informed to the Operational Control center of the company, who transmits them then for the other tolling squares, to speed the attendance in case of accident with the vehicle.

Final comments

So, as hypothesis we can say that this labels are not well understood. It's believed that they don't show any meaning to drivers, as they should by telling about the risk. Or what good is that and how do deal with it in case of an accident. They don't actually fulfill their part for not being as representative as they are supposed to.

This lack of knowledge extends to the dangerous good vehicles drivers. Among the major irregularities there is the transportation made by people who are not habilitated, with false driver's license, that don't know the risk of the product using inappropriate vehicles. "In some cases of accidents the truck driver can't inform what kind of load he is caring" affirms Mr. Paciência, responsible for a Fire Department in Brazil.

Concluding we can affirm that there must be made a deeper investigation about this subject in order to obtain more data that point to the driver's difficulty in the interpretation of this visual signs more precisely. After that there must be initiatives to propose recommendations to a future redesign to produce instructive material about this subject.

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