

Vehicle Transport Organization of Food Requiring Refrigeration

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Summary. The paper presents a description of the legal requirements for car transport of foods that require refrigeration. Were also carried out a survey among drivers involved in this kind of transport, in order to assess the knowledge of drivers about the transport of perishable food that requires cooling.

Key words: perishable foodstuff, vehicle transport, legislation.

INTRODUCTION

Nowadays the demand is rapidly growing for food with high sensory quality, fresh and rich in nutrients. This phenomenon is not only the driving force for the development of agri-food industry, but also in the field of logistics and transport of refrigerated foods. This progress has resulted in the possibility of provision of even very distant markets for perishable foodstuff. [9, 12].

More and more often, the transport of food products has been using methods of preservation of these products involving the application of the cooling systems. This allows the short-term storage of fresh food at a temperature from 10 to 0 °C or long-term storage in a frozen state at a temperature from -12 to -22 °C [1, 2].

The advantage of the method of cooling is a complete stop or slowing down of microbial growth in both chilled and frozen foods. Furthermore, foods preserved by this method retain vitamins and organoleptic characteristics of the fresh food. The fulfillment of such conditions requires compliance with the principles of transport conditions of perishable foodstuffs and the selection of proper means of transport. Special means of transport for perishable food items are:

- (insulated equipment),
- (refrigerated equipment),
- (mechanically refrigerated equipment),
- (heated equipment).

Participation in road transport of perishable goods, as well as dangerous goods, has been systematically increasing, which requires strict compliance with the relevant provisions [4, 8, 14, 15].

Persistence and quality of transported, refrigerated food products depends mainly on micro-climatic conditions prevailing in the cargo area. The main parameter is the temperature, which depends on the product being transported. the variations of the temperature should be kept to the minimum [13, 16].

During the loading, transport and unloading, the highest temperature of frozen and deep-frozen foods should not exceed the temperatures given in Table 1

Table 1. Temperature required for the transport of frozen and deep-frozen foodstuff [1, 2, 5, 13].

Type of food article	The required transport temperature
Frozen or deep-frozen cream and fruit juice concentrates	-20°C
Frozen and deep-frozen fishes	-18°C
Any other deep-frozen foodstuffs	-18°C
Frozen butter and other fats	-14°C
Frozen offal, egg yolks, poultry and game	-12°C
Frozen meat	-10°C
Any other frozen foodstuffs	-10°C

This temperature may increase, for example in the evaporator during the defrosting of the means of transport (mechanically refrigerated equipment). In such case, the temperature is allowed to increase no more than a 3° C with respect to the required temperatures.

Furthermore, the highest temperature anywhere in cargo during loading, transport and unloading of non-frozen foods should not exceed the temperatures given in Table 2.

Table 2. Temperature required for the transport of non-frozen and non-deep-frozen foodstuff [1, 2, 5, 13].

Type of food article	The required transport temperature
Poultry	+3°C ¹⁾
Butter	+6°C
Game	+4°C
Milk tanker (raw or pasteurised) intended for direct human consumption	+4°C ¹⁾
Industrial milk	+6°C ¹⁾
Milky products (yogurt, kefir, sour cream, cottage cheese)	+4°C ¹⁾
Fishes (should always be transported in ice) ²⁾	+2°C
Prepared meat products	+6°C
Meat (excluding poultry)	+7°C
Poultry and rabbits	+4°C

¹⁾ In principle, transport time should not exceed 48 hours.
²⁾ With the exception of smoked fish, salted, dried or live.
³⁾ With the exception of products in the stabilized state by salting, smoking, drying or sterilization.

Another important parameter of mechanically refrigerated equipment is humidity, which sets automatically and does not require control.

Moreover, the interior of transport should be clean in order not to lead to the development of microorganisms. Before loading, in accordance with the principles of good transport, refrigeration compartment of the vehicle should be cooled to a temperature appropriate for a given food product.

Carriers must be informed (need to know) about the fact that transport of frozen, deep-frozen and unfrozen food must be included as a component of the storage time. Therefore, the drivers carrying food should note that transportation of certain articles of food may be close to the optimum storage time and therefore often vehicles should be treated as a special kind of magazine [16].

Suitable conditions for the transport of food and sanitary safety, as in force in Poland since 1984 ATP (A-agreement, T-transportation, P-perishable) agreement of the "International Carriage of Perishable foodstuffs and the special equipment for such carriage" require appropriate identification of means of transport and the required documents [10].

Means of transport intended for the carriage of perishable food products, which meet the terms of the agreement ATP, should be marked by signs ATP (Fig. 1), which is mounted in a visible location on the wall of the building isothermal for the passenger side. The table contains the marking class of ATP, month, year and validity of the certificate.



Fig. 1. Certification plate of compliance of the equipment – *the particulars in square brackets are given by way of example [1, 2]

On the other hand the driver should have the original certificate of ATP in Polish and English. Sample guidelines for verification of the equipment in the transport of food are shown in Figure 2

The requirements related to the admission of vehicles to traffic must be consistent with the requirements contained in the ATP agreement (Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage).

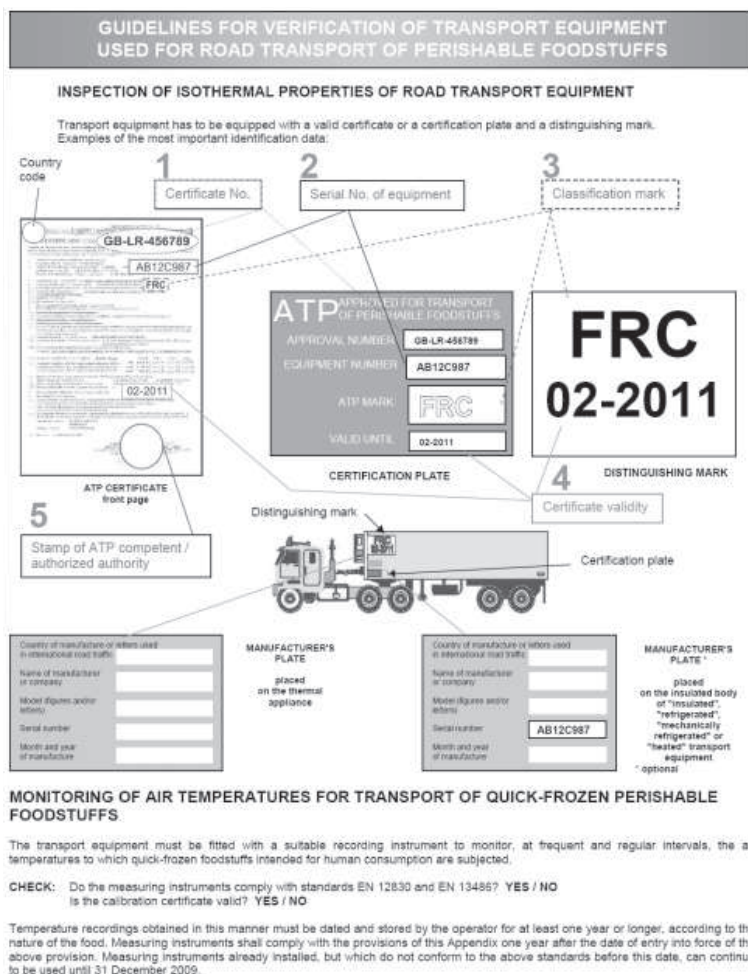


Fig. 2. ATP example of good practice [3].

The United Nation Economic Commission for Europe has information about the performing centers (Competent Authorities and Test Stations list) [3, 7]. COCH performs periodic checks of insulated body in order to extend the period of validity of the ATP certificate (FRC FNA).

For example, in the context of accreditation for the Polish Centre for Accreditation, COCH performs:

- inspections which are the basis for obtaining certification of ATP,
- measurements of the overall coefficient “k” of heat transfer for both the new means of refrigeration transport and the in-service one as the basis for obtaining certification of ATP,
- complete testing of mechanically refrigerated transport (air-conditioned semi-trailers, refrigerated trailers, refrigerated trucks, etc.) and not mechanically refrigerated transport (icehouse cars),
- research on the effective refrigerating capacity of the cooling unit,
- measurements of the overall coefficient “k” of heat transfer for liquid foodstuffs tank trucks [6].

The domestic and international provisions require the carrier to transport equipment with a measuring device recording the air temperature inside the vehicle. Waveforms obtained from the temperature changes registration, depending on the type of product being transported, must be kept for at least one year. Monitoring and recording of temperature also applies to loading of goods, which should be chilled to the optimum storage temperature (transport) refrigerant. It is also important to control the temperature of food products being unloaded [11].

The driver (employee) has to be competent and possess the knowledge of all the requirements contained in these regulations.

THE AIM AND THE RANGE OF WORK

Transportation of food requires from carriers the knowledge of road traffic regulations and specific regulations concerning the carriage of perishable foods.

The main aim of the study was to examine the drivers’ knowledge of the requirements relating to the transport of frozen and perishable food. The study was conducted among drivers transporting food in the Lublin region.

METHODOLOGY

The study used an authorial questionnaire with basic information about the respondents (age, years of work in the profession as a driver, etc.) and other specific questions. An anonymous questionnaire sheet was prepared in the Department of Technology Fundamentals. The survey included the following questions:

QUESTIONNAIRE SHEET

Please kindly complete a survey, which will be used to check the drivers’ knowledge about the knowledge

requirements for the transport of food in special conditions.

Table 3. General information

1. Age		
2. The experience of work in the driver’s profession (in years)		
3. The experience of work in perishable foodstuff vehicle transport (in years)		
4. The type of transport character	regular	
	casual	

Table 4. Information on the used type of isothermal transport vehicle

1. Insulated equipment	
2. Refrigerated equipment	
3. Mechanically refrigerated equipment	
4. Other	

Table 5. Information on time, temperature and kind of perishable foodstuff

1. Are you always informed on what kind of products you transport?	Yes	No	I don’tknow
2. Do you know what is the required temperature during transport of food?	Yes	No	I don’tknow
3. Do you know the time required for the transport of food?	Yes	No	I don’tknow
4. Do you know the required time associated with loading and unloading of transported food?	Yes	No	I don’tknow

Table 6. Information on vehicle designation, necessary transport documents and general rules of vehicle transport

1. Do you know how a car for the transporting of food should be marked?	Yes	No	I don’tknow
2. Do you know what document is necessary while transporting food?	Yes	No	I don’tknow
3. Do you know where the ATP rating plaque should be placed?	Yes	No	I don’tknow
4. Do you know what the first letters of the ATP rating plaque are?	Yes	No	I don’tknow
5. Do you know the rules of “good transport practice”?	Yes	No	I don’tknow

The survey was conducted in three service companies operating in the transport of food.

RESULTS

The survey was carried out among 23 drivers between the ages of 24 to 45, who have been working in the profession of driver from 2 to 22 years and have experience in the transport of food from 1 year to 5 years. Information concerning the type of transport used is shown in Figure 3, and the work experience in the transport of food in Figure 4.

Approximately 80% of the surveyed drivers have had a 5-year or longer work experience in the transport of food. 74 % respondents from all the means of transport of perishable foods used mechanically refrigerated equipment.

Twenty of all the tested drivers declared that they always have the information as to what kind of food is transported by them (Figure 5), but only 38% of drivers know the rules of “good transport practice” (Figure 6).

Over 90% of the drivers can tell what the required temperature for the transport of food is. Similarly, the drivers are aware of the time limit, depending on the types of transported food. Almost all of the respondents know where the ATP rating plaque should be placed and how a car should be properly marked for the transporting of food.

CONCLUSIONS

A food carrier should remember that he is also a consumer. On his knowledge of the procedures followed for the transport of perishable products, their quality depends. The conducted surveys have shown that the examined carriers are competent as to the requirements for the transport of deep-frozen and frozen food products.

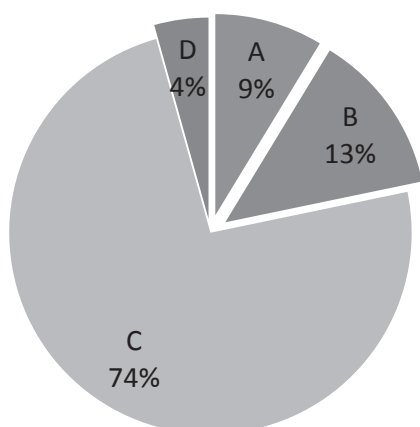


Fig. 3. Information about the vehicle kind used: A – insulated equipment, B – refrigerated equipment, C – mechanically refrigerated equipment, D – other.

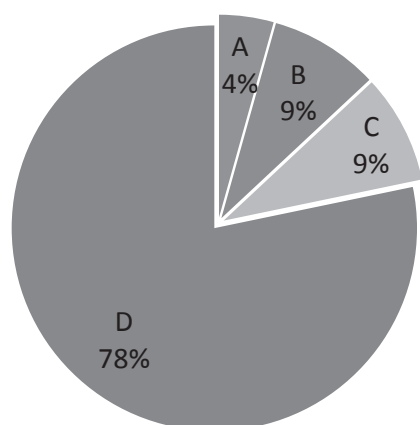


Fig. 4. The experience (in years) of work in perishable foodstuff vehicle transport: A – below 1 year, B – 1-3 years, C – 3-5 years, D – 5 years and more.

Among the surveyed drivers there were mainly the carriers of fish and frozen or deep-frozen products. Requirements related to the archiving of shipping documentation, registration and cyclic temperature control in vehicles were met. The problem to which the attention was drawn by the driver was associated with increases in the time of unloading of the goods. The consequence of that situation may be a raise of the temperature in the vehicle. This situation is usually caused by the lack of assistance from another person (assistant driver, handling assistant at the customer). Therefore, the unloading time may be longer due to self-unloading.

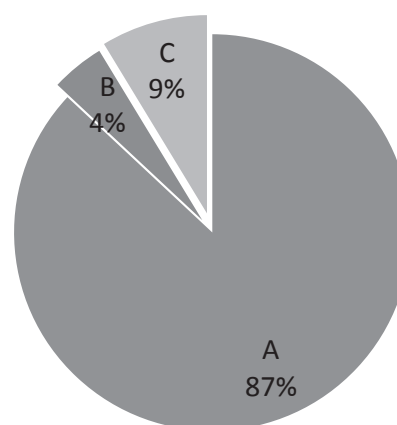


Fig. 5. Are you always informed on what kind of products you transport? A – Yes, B – No, C – I don't know

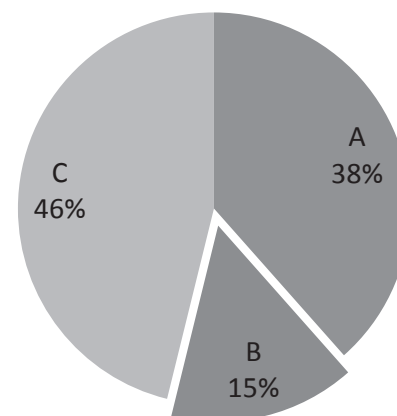


Fig. 6. Do you know the rules of “good transport practice”? A – Yes, B – No, C – I don't know

REFERENCES

1. ATP Agreement (valid from 23.09.2013) [online access] http://www.unece.org/fileadmin/DAM/trans/main/wp11/wp11doc/ATP-2013_e.pdf
2. ATP Agreement (valid from 23.11.2014) [online access] http://www.unece.org/fileadmin/DAM/trans/doc/2014/wp11/ATP-2014_e.pdf
3. ATP Handbook. [online access] <http://www.unece.org/fileadmin/DAM/trans/doc/2014/wp11/Handbook-2014e.pdf>
4. **Bęczkowska S., Grabarek I., Choromański W. 2012:** Modelowanie ryzyka w drogowym transporcie towarów

- niebezpiecznych z uwzględnieniem czynnika ludzkiego. Ergonomia w warunkach gospodarki opartej na wiedzy. Redakcja: Złowodzki M., Ogińska H., Juliszewski T., Pawlak H. Komitet Ergonomii PAN, Kraków-Lublin.
5. **Bieńczak K., Zwierzycki W. 2006:** Samochody chłodnicze w transporcie żywności. Systherm. Poznań.
 6. Centralny Ośrodek Chłodnictwa – zakres badań ATP [online access] <http://www.coch.pl/Badania-ATP,15,b-en>.
 7. Competent Authorities and Test Stations List [online access] <http://www.unece.org/fileadmin/DAM/trans/main/wp11/teststations.pdf>
 8. **Kwaśniowski S. 1997:** Zasady dobru urządzeń chłodniczych i grzewczych do nadwozi izotermicznych. w.: Pojazdy izotermiczne i chłodnicze. Oficyna Wydawnicza Politechniki Wrocławskiej. Wrocław.
 9. **Łaski M., Paluch S. 2005:** Transport drogowy osób i rzeczy. Grupa IMAGE, Warszawa.
 10. Oświadczenie o przystąpieniu do umowy o międzynarodowych przewozach szybko psujących się artykułów żywnościowych i o specjalnych środkach transportu przeznaczonych do tych przewozów (ATP). Dz. U. 1984 nr 49, poz. 254. 26 października 1984. [online access] <http://isap.sejm.gov.pl/Download?id=WDU19840490254&type=2>
 11. **Prochowski L., Żuchowski A. 2006:** Samochody ciężarowe i autobusy. Wydawnictwa Komunikacji i Łączności, Warszawa.
 12. **Rydzkowski W., Wojewódzka-Król K. 2005:** Transport. Wydawnictwo Naukowe PWN, Warszawa.
 13. **Steindel M., Schnotale J. 2008:** Mrożona żywność i jej transport zgodnie z przepisami Unii Europejskiej. Samochodowy transport chłodniczy. Dodatek miesięcznika Chłodnictwo & Klimatyzacja. Euro-Media, Warszawa, 5-14.
 14. Ustawa o transporcie drogowym, Dz. U. 2001 Nr 125 poz. 1371 z dnia 6 września 2001 r. [online access] <http://isap.sejm.gov.pl/Download?id=WDU20011251371&type=3>
 15. Ustawa o transporcie drogowym Dz.U. 2013 poz. 1414 z dnia 15 października 2013 r. [online access] <http://isap.sejm.gov.pl/Download?id=WDU20130001414&type=1>
 16. **Zwierzycki W., Bieńczak K., Rochatka T., Stachowiak A., Tyczewski P. 2008:** Badania pojazdów chłodniczych oraz kontrola temperatury w ładowni. Samochodowy transport chłodniczy. Dodatek miesięcznika Chłodnictwo & Klimatyzacja. Euro-Media, Warszawa, 15-18.

ORGANIZACJA TRANSPORTU SAMOCHODOWEGO ŻYWNOCI WYMAGAJĄCEJ CHŁODZENIA

Streszczenie. W artykule zaprezentowano opis wymagań prawnych związanych z transportem żywności wymagającej chłodzenia. Przeprowadzono ankietę wśród kierowców związanych z takim rodzajem transport. Ankieta miała na celu sprawdzenie stanu wiedzy kierowców w zakresie przewozu żywności szybko psującej się, która wymaga chłodzenia.

Słowa kluczowe: artykuły żywnościowe, transport samochodowy, regulacja prawna

