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TITRE

# Analysis of welding problem and cracking of bolt hole that caused two leakage issues of C84E backlight in PSA

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## Abstract

The article mainly talks about that as a quality resident in Group PSA Rennes for helping closing the Incident. The X supplier provides the rear lamps to PSA Rennes for the C84E Citroen. X supplier met some incidents and started some sorting missions. The article talked about the process of dealing with incidents and product's analysis based on the rear lamps. The lamp's material is mostly made of acrylonitrilee-butadienee-styrene(ABS) and polycarbonate(PC). The analysis is about ABS/PC blends' welding, injection and fracture in the second section.

**Keywords: Incidents; Welding; Injection; Fracture; ABS/PC**

## Résumé

L'article parle principalement de cela en tant que résident qualité dans le groupe PSA Rennes pour avoir aidé à clôturer l'incident. Le fournisseur X fournit les feux arrière à PSA Rennes pour la C84E Citroën. Le fournisseur X a rencontré certains incidents et a commencé des missions de tri. L'article parlait du processus de traitement des incidents et de l'analyse du produit basée sur les feux arrière. Le matériau des feux sont principalement composé d'acrylonitrile-butadiénée-styrène(ABS) et de polycarbonate(PC). L'analyse porte sur le soudage, l'injection et la rupture des mélanges ABS/PC dans la deuxième section.

**Mots clés: Incidents; Le soudage; L'injection; La rupure; ABS/PC**

# Introduction

## Context

The company Haishi is focusing on providing quality services mostly for Chinese suppliers who have cooperation with European enterprises. Normally its employee is in charge with multiple suppliers and clients in different places. There were the experienced employees who taught the introduction of the products and the basis of the work in practice. The introduction was divided by three lessons, and each lesson lasts 2 hours for different knowledge according to the products and different suppliers.

In practice, the work mainly includes getting access to Amadeus, reaching the bad pieces, contact the technician, helping start sorting mission in Trigo, providing technical support. And after all experiments done by the supplier, explain to the PSA technicians what have be done and what reasons might caused the incident.

There are 5 suppliers in Rennes cooperate with Haishi company. Certain suppliers' products are in a very good quality and there wasn't incident during a long time. A supplier, which is called X company , creates the lamps for the PSA Rennes, in the programme C84E Citroen, and possesses more incidents.

## Challenges

The work as a resident in PSA normally is independent. So challenges are inevitable. The challenges are multiple here, personal understanding, good expression and explanation.

The challenges for the beginner are different. For instance, for engineers who has a background in technique, the challenge is the communication with others. Like how to response to different situation or people, bad impression or wrong understanding on the European clients could happen. There is an example for explaining this. If one claim was made, then the resident needs discussing with the supplier's engineers for further requirement and explanation, some information, for example their unreasonable demands cannot completely pass all to the client. The correct way is to check the reasonableness of the demand firstly, then for the good of suppliers, propose their requirements in a proper manners.

Besides the communication with the suppliers, it's also needed to have some meetings with PSA technicians who is the client of suppliers.

The meeting with client happens in two cases, the first is to verify problems of the claim, like what are these defaults, is it 0 km or clientele, is it necessary to do the sorting. Confirm the problem by install the pieces on the car to compare with good ones if necessary.

The second case is after the experiments done by suppliers. The suppliers will provide a final report, the resident needs to do the further explanation of the report. These reports in English are given by Chinese and received by French, so if there isn't any further explanation to PSA technicians, it might have a

possibility that the technician does not understand what the supplier wrote in their reports. Which will cause nonacceptance of report and rejected for cancellation etc. Residents need to do enough effort to make sure the claim end. Try to use personal advantage in certain domains' background for professional explanation.

For the goods of the suppliers doesn't mean residents will do everything to ensure that.

All the facts above are based on the complete facticity. No skulduggery is tolerable for all the experiments and all the reports explain between resident and suppliers' engineers. In brief, there is a way for compromise but there is no acceptance for faking the truth.

The challenge also lies in quickly gaining amount of background of different products, the lamp, the car window glasses, light decoration, ventilator scoop inside the car. But the knowledge doesn't mean all, only points at some basic knowledge and the previous incident presented in Amadeus. This needs the resident to check the previous incidents frequently.

## Comment knowledge of the lamp

For a certain product, it possesses a series of terminology and its own way for describing and recognizing the product's problems. So the resident needs the common knowledge and communication for explaining its problems. For example, the way of recognizing the rear lamp's sides A, B, C and D is important for explaining installing condition on the car. The following 4 figures 1,2, 3, 4 show the main method of recognizing the 4 sides, but it's not the lamp that is used in C84E Citroen.

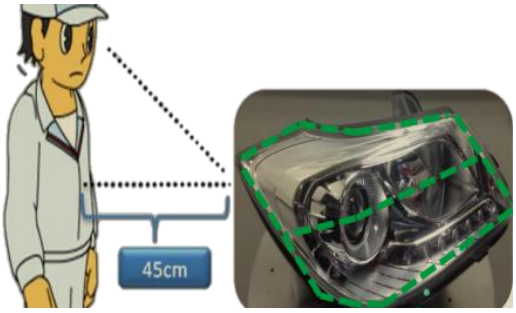


Fig. 1. Side A: The lamp is located 45CM in front of the chest, looking down to see the smooth area. (Observation surface: front of the lamp/part)

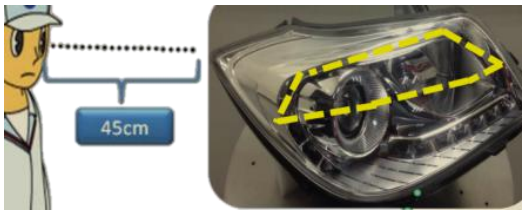


Fig. 2. Side B: The lamp is located 45CM in front of the face. Horizontal view of the smooth area and A area of the stripe surface, can be located in the internal area of the product. (Observation surface: upper side of lamps/parts, left side and right side)

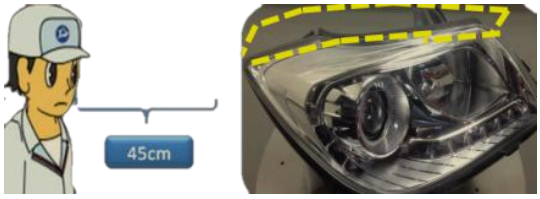


Fig. 3. Side C: The inner area of the product can be identified by a colorless zona pellucidine or a colored zona pellucidine. (Observation surface: upper and lower sides of lamps/parts, left and right sides)

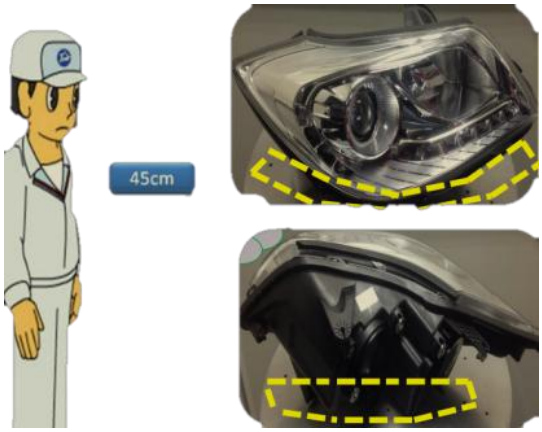


Fig. 4. An area where the lamp is not in its proper position.(when the front cover, trunk cover, or back door is open).

The rear lamps of C84E Citroen is shown in fig. 5.

Fig. 5. Fender lamp(L) & trunk lamp(R)

For the lamps in use of C84E Citroen, here is the introduction.
Below is the function of the lamps, shown in fig. 6. The fig. 7. shows the details of the fender lamps and the fig. 8. shows the details of trunk lamps.

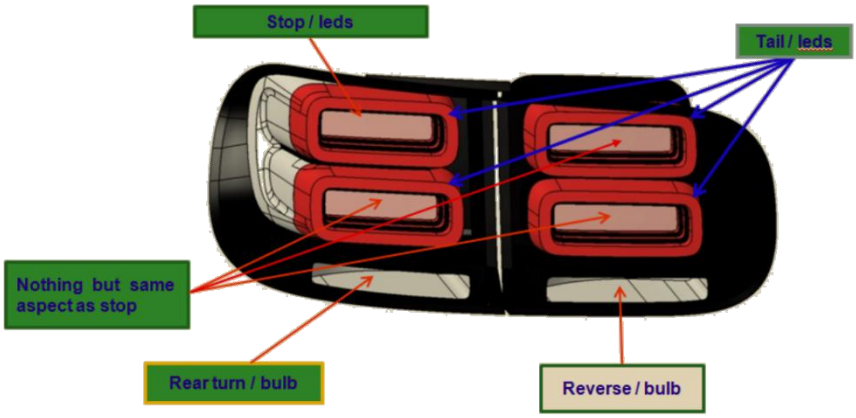


Fig. 6. functions of the assemble lamps

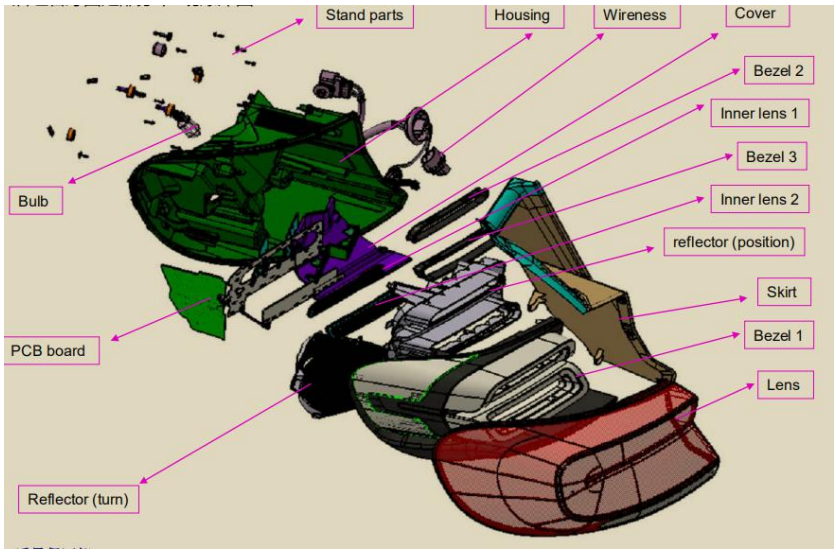


Fig. 7. shows the exploded drawing of the fender lamp

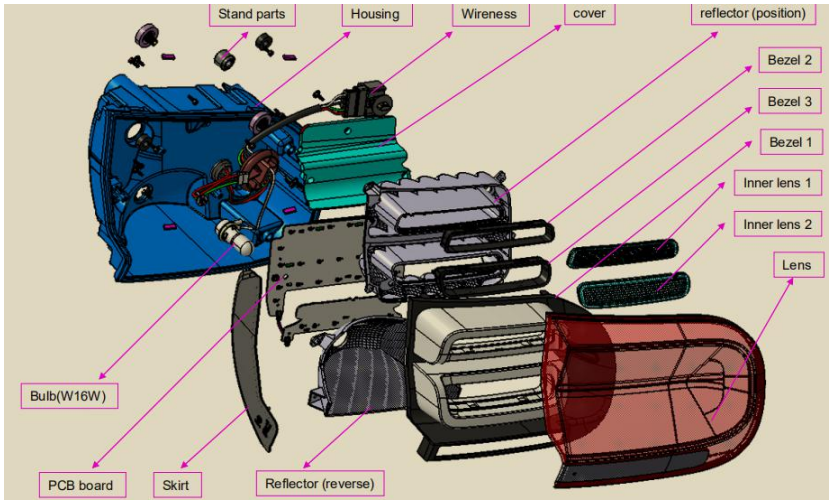


Fig. 8. shows the exploded drawing of the trunk lamp

All the training is for the better communication between X and the resident. There are the training in surface defect recognition. As a long term cooperation, these training are necessary. Because sometimes if the resident could do some technical detection, there is no need to do the delivery which is

expensive.

**The basis introduction of the lamps' problems**

There are two serious problems of the lamps during the past 6 months.
The welding problem which caused the leakage of water and the crack of the bolt hole which also caused the leakage of water. The text will mainly focus on the two problems. The details will be shown in the second section of the thesis.

**The introduction of the light**

The material of the lamp is the blends of ABS/PC. As shown above the lens and the house are two different parts, so there need to be welded. The way that they used for the welding is by heating the material then press the two parts. After it the will put it in a warm place for quenching which released the stress between them.
In the factory of X supplier, they basically use this material to make car lights, but different car lights have different measures in terms of air-tightness. Some of them directly heat weld the two parts together, such as the taillights they provide. Some are to directly glue the two parts together, and the second is generally used in daytime running lights. In the past, there have been some problems in functionality, appearance, and structure. Functional failure is mainly reflected in the light of bulbs, but this kind of problem is mostly accidental; appearance failure is mainly reflected in the appearance of some foreign objects, such as welding waste in the lamp; the structure is mainly poor welding or cracked bolt seat causes water to enter. Multiple problems of each type will be screened. Basically, all problems will be screened after they arise, and rework will be carried out if necessary. In the past five or six months, there have been many problems with car lights. The problems mentioned above have all appeared, and related problems need to be solved every time. Since some problems are relatively simple and easy to confirm the cause of the problem or confirm that it is an accident, it is relatively simple to deal with, so in the second part, we mainly introduce two accidents that are more difficult to judge the true cause.
The first problem is that on the surface of the welding place, there is water coming into lamp during the sprinkling test.
The second problem is that there is a crack of the bolt hole on the house, which will make water coming into the lamp too.
Bellow provides more details of the process.

## The procedure of handing quality problems

Below is the procedure that shows how the job launches, proceeds and finishes. Shown in fig. 9.

**Objectives**

This part is the result of a daily discussion about a number of employees in the company, including me, who work remotely during isolation. The goal is very simple, is to more standardize some employees to consolidate the way, to ensure that there will be no major mistakes, to avoid some unnecessary losses, but also to gradually improve the company's professionalism.

Fig.9 shows the procedure when there is one accident in the factory, what should be done for the supplier and the client for example in France PSA.

The real aim of the procedure is to close the incident, so that the supplier won’t get more loss. In order to do so, it is better to follow a certain procedure.

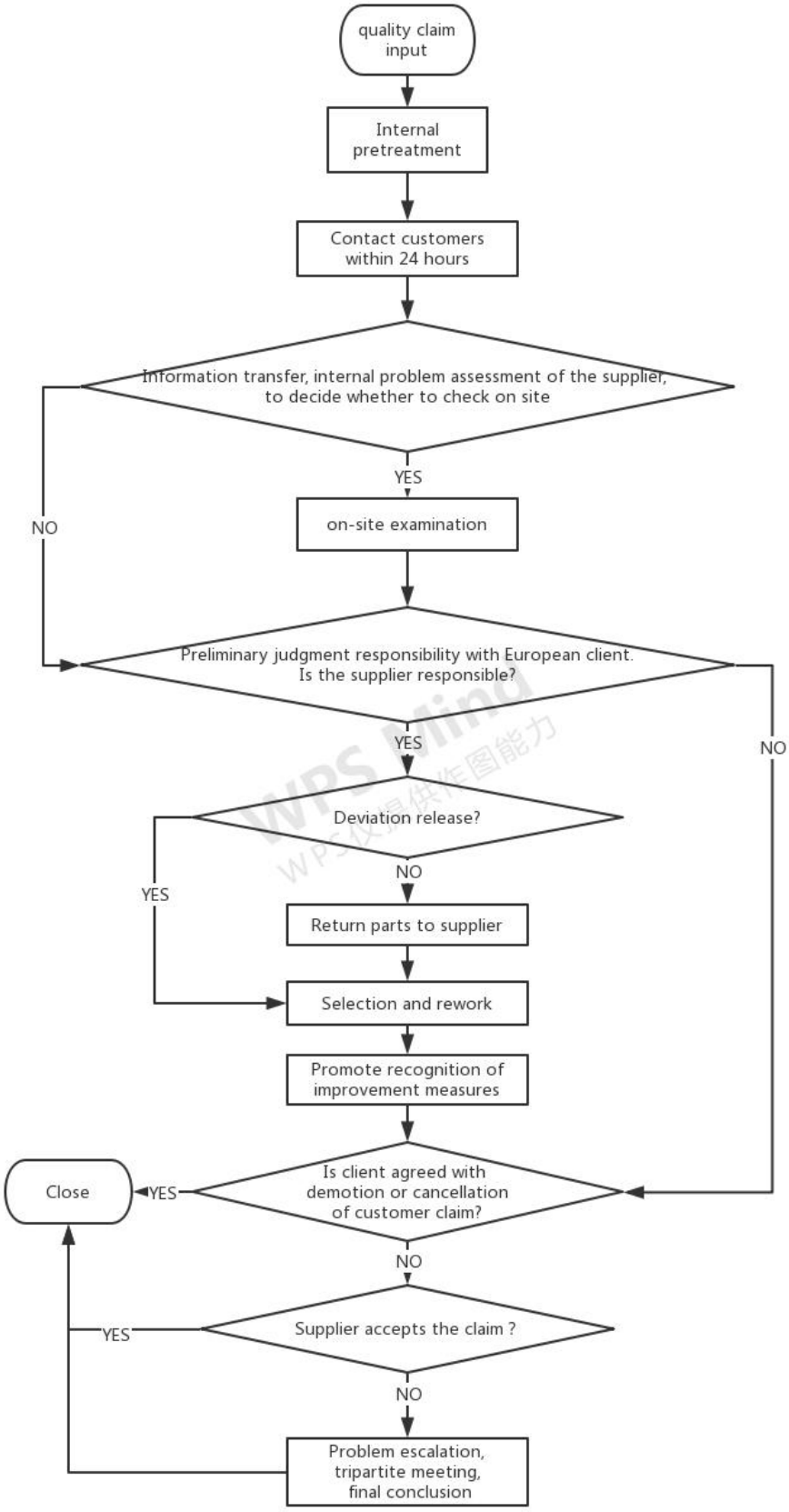


Fig. 9. The procedure of handling the quality problem

All the description will be introduced as follow:
1. Quality claim input: The quality problem is entered as the system customer claim, and the relevant personnel of customer SQE or supplier contact relevant resident of Haishi company.

2. Internal pretreatment: The quality problem is first inquired and evaluated in our company. The evaluation is classified into two categories: ordinary and urgent. The urgent quality problem includes but not limited to personnel change, mass selection, line break, line stop, safety problem, and other problems that are judged seriously or cannot be solved by subjective judgment. In case of emergency, the problem should be upgraded to the superior and the internal meeting should be organized immediately to discuss the plan.

3. Contact customers within 24 hours: Contact the customer immediately after the internal pretreatment, inquire about the unclear items in the quality problem, and inquire about the extension problems according to our relevant processing experience. It should also be emphasized that the problem piece cannot be destroyed before arriving at the site.

4. Information transfer, internal problem assessment of the supplier, to decide whether to check on site: Deliver the information to the supplier, evaluate the progress of the problem internally, decide whether to view the problem on site, if necessary, prepare the field support and query summary sheet, or other methods to record the problem.

5. On-site examination: Go to the factory site to check the quality problem.

6. Preliminary judgment responsibility with European client. Is the supplier responsible: According to the information we have, if we are responsible for the problems of The European customers, we need to keep good evidence. If we are responsible for the problems of the European customers, we can cancel the quality customer claim through negotiation. Evaluate and apply for the next deviation release if it is the supplier's problem.

7. Deviation release: If it is determined that the supplier is responsible, the feasibility assessment of deviation release shall be conducted. If there is sufficient evidence to prove that there is no impact, the internal meeting shall discuss the deviation release decision when the application is required. If this is not possible, skip this step.

8. Return parts to supplier: Send back the quality problem parts.

9. Selection and rework：Identify whether selection is needed. If so, identify whether we should organize the selection of rework. If residents need to

organize the selection of rework, refer to *Selection and Rework Process* for details. Skip this step if does not need to sort and rework.

10. Promote recognition of improvement measures: According to the supplier's reasons analysis report, assist to drive the system customer complaint filling in Amadeus and customer recognition and acceptance.

11. Is client agreed with demotion or cancellation of customer claim：After the meeting for explaining reasons that caused the incident, if the client agree the incident can be degraded or cancelled, that will make sure the claim be closed. If it is the supplier's responsibility, apply for the demotion or cancellation of customer claim. If it is the European customer's responsibility, directly apply for the cancellation of customer complaint, and handle it according to the previous cases or experience of demotion or cancellation.

12. Supplier accepts the claim：This is after transfer the customers' opinions on how they think about the responsibility of the claim. Is the supplier accepts the claim?

13. Problem escalation, tripartite meeting, final conclusion：If the supplier does not agree with the client's decision, it is necessary to organize a tripartite meeting between customers and suppliers to discuss a final agreement.

14. Close： The claim is finally close in Amadeus system, no matter it is cancelled, degraded, or it is accepted by suppliers who will pay the compensation.

The main process is created like this, but personally, the resident is allowed to use personal ability of dealing problems to solve problems without causing trouble.

## Discussions

For the welding problems, thees analysis is sufficient and there wasn't enough materials for proving which reasons might be able to cause such a problem. Even there is not some records of the changes in the factory production line, the analysis of the problem are good, the reasons are reasonable and reliable because there are almost all possibilities are considered and cleared.
So after the first problem happened, the plan of action is made immediately, add more records if there is any change in production line. Do more test after the length changes.
For the cracking issue,all the factors that might cause the problem were verified and tested. Almost all analysis are declared and proved if there were the final reason. Based on all the fact seen in the factory, however, the problem wasn't totally recognized by supplier, the most serious part in the screw hole

wasn’t mentioned. It is the starting part of cracking so the analysis of this area is essential. But similarly the report given by the supplier didn’t stress it out.
The stress concentration should be considered more important cause. As the housing is not thick enough, so some areas where stand the high pressure should avoid. Even though this isn’t perfectly for the second analysis, problem has been solved finally. What’s more, all the analysis give the reference for the future if there is some similar problem happen.
Besides, the first part mainly introduces the method of working in PSA as a quality engineer resident, and the important part of the work content in the second part. Regarding the determination of the working method, at the beginning, a master took me to understand the content of the work and related background knowledge, so that it is convenient to start the work. Since I am an expatriate, I work independently in the work, and some do not understand the needs seek help from Master remotely. At work, I mainly receive part of the information on Amadeus. Since I am based in the factory, after getting familiar with the quality engineer of PSA, we will confirm the problems on the assembly line together on site.
Since I am not a single supplier, there are other products that I am responsible for, such as the window glass, vents, and daytime running lights of certain parts of the C84E project. There are also some other product related information is also taking into account and learning.
In addition to the technical information on the product, there are some other basic industry information such as logistics, selection, quotation, bargaining, after-sales, and so on.
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There are also some other product related information is also taking into account and learning.
In addition to the technical information on the product, there are some other basic industry information such as logistics, selection, quotation, bargaining, after-sales, and so on.
The second part mainly talks about the ins and outs of the two accidents.
The welding problem is determined as the mold’s position changes heating line,

lead to the cracking. There is another possibility, the surface temperature of the hot tooling.
The cracking problem is determined as the process of injection in the beginning is not stable. Then the air will enter and be trapped in the material, under high temperature and high pressure, the plastic will not be able to well injected and it will loss its molecular. Finally, the structure is not strong enough.
There is another possibility, the structure design of the housing structure is not perfect facing to some bad injection situation.
From the practical point of view, both analysis should be verified in the production line. Since all possibilities are considered but no precise reason was completely sure, the improvement should be implemented. For own aspects, more details will be given in the second section.
More improvement should be done in theory, but in practice there is no need since all the requirements are qualified.

**NB:**Since many reference materials belong to the supplier's internal materials, it is not convenient to upload and share all, and some materials are not published articles so it is not presented here reference.
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