

# Increasing the Efficiency of the Bonus / Malus Determination Process When Contracting Auto Liability Insurance

**Dragan Mihić**

IQC Ltd, IT programmer and developer in Financial Sector, London, UK, dmijic@yahoo.com

**Tomislav Vujinović**

Pan-European University APEIRON Banja Luka, Republic of Srpska, Bosna und Hercegovina, tomislav.d.vujinovic@apeiron-edu.eu

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**Abstract:** Decrease in the price of the policy in the following text Bonus and increase in the price of the policy in the following text Malus is currently determined by searching the data in spreadsheets, hereinafter referred to as the Book of Incidents. The owner of the book of incidents is the Insurance Agency, which collects data from all active insurance companies. The insurance agency migrates all collected data into one file and distributes it by e-mail or CD to all active insurance companies. The book of incidents is a Microsoft Excel file from which the insurer can search for a vehicle or insured person who may have caused an incident in the past, damage to his vehicle as well as to the vehicle or a third party.

**Keywords:** Bonus, Malus, Insurance, Incident book, Vehicle insurance, Insurance company.

## THE PROBLEM AND OMISSIONS OF THE EXISTING SYSTEM IN THE CALCULATION OF BONUSES AND MALUS

Insurers are currently using the Microsoft Excel spreadsheet when searching. Based on any data found (incidents) about the vehicle and the insured, the bonus and malus are determined. This system does not take into account all the statutory provisions of the Insurance Supervision Agency. Current legal provisions are defined and can be found on the portals of the Insurance Agency in BiH - <http://www.azobih.gov.ba/> and insurance agencies in RS - <http://www.azors.rs.ba/azors/index.html>.

The book of incidents is updated periodically, once a month, where each insurance company updates its own data related to damages and incidents. After collecting, migrating and updating the data, the insurance company sends the collected data by email or CD to the central insurance agency. Insurance agencies migrate all data into one file and send back updated data to each insurance company via email or CD.

After several years of using this system for determining malus and bonus, it turned out that there are a number of omissions and problems in this system such as:

- Fields in Microsoft Excel are not formatted, so data related to damage cannot be found and compared accurately and easily. For example, the date of occurrence of the damage is not the same format in all insurance companies. In some insur-

ance companies date format is DD.MM.YYYY and in some MM.DD.YYYY or DD.MM.YY.

- Data in Microsoft Excel is not standardized. For example, the record related to repaid damages is defined differently in each insurance company. In some insurance companies, if the insured repays the damage, the damage record is deleted from the book of incidents, while in other insurance companies this record is left in the book of incidents with the comment that the damage has been redeemed.
- The possibility of an error in the data search as well as the untrainedness of the insurers who is performing the search. For example, driver information may appear in several places but entered differently. In some cases, the data is entered in format of first name and last name, and in other cases, in format of last name and first name.
- When searching for data, it is impossible to take into account and process all inquiries and checks prescribed by the Insurance Agency in legal provisions.
- There is no possibility of automatic data search or automatic determination of bonuses and malus from database. Therefore, it is impossible to determine the exact bonus and malus when buying a policy online as well as other automated systems.

## LEGAL PROVISIONS OF THE INSURANCE SUPERVISION AGENCY

Legal provisions are defined in the conditions for ensuring the owner or user of motor vehicles against liability for damages caused to third parties.

### Premium reduction terms and conditions (Bonus)

If the vehicle has been insured for at least one year and if at that time there was no reported damage for which the insurer paid compensation or at the time of extension of the insurance the damage was not in liquidation (hereinafter reported damage) the insured is entitled to a discount for that vehicle in the following insurance year in the amount of:

- -10% if no damage was reported in the previous insurance year
- -20% if no damage has been reported in the past two consecutive years of insurance
- -30% if no damage has been reported in the past three consecutive years of insurance
- -40% if no damage has been reported in the past four consecutive years of insurance
- -50% if no damage has been reported in the last five or more consecutive years of insurance

The provisions of these above percentages apply to policyholders who have up to five insured vehicles.

An insured person who has acquired the right to a discount of more than 50% under the previous premium system retains that right until the first claim in the sense of the previous paragraphs or until the loss of the right to a bonus on some other basis.

An insurance company who has concluded insurance with a duration of at least one year for six or more vehicles, where the ratio of claims paid to premiums paid in the past three calendar years is less than 68%, calculates a premium discount for the next insurance period of half (50%) of the difference between 68% of the percentage of the realized relationship. An insurance contractor who has not paid a claim in the past 3 calendar years is entitled to a 50% bonus.

### Terms and legal provisions for premium increase (Malus)

- a. An insurance company who has concluded insurance with a duration of at least one year for 5 vehicles, the premium for the next insurance year is increased, if in the previous insurance period two or more damages were reported based on his insurance.

Premium increase is:

- + 50% for two reported damages
- + 80% for three reported damages

- + 120% for four reported damages
- + 200% for five or more reported damages

And that for the vehicles that caused the damage, that is, for the vehicles that replaced them.

- b. An insurance company who has concluded insurance with a duration of at least one year for 6 or more vehicles, where the ratio of paid damage to paid premium in the past 3 calendar years was more than 110%, calculates the premium (malus) on the premium in the percentage equal to half of the difference between the realized ratio and 110%, provided that the allowance may not exceed 85%.

### Other provisions on bonus and malus

The following provisions also apply when contracting insurance premiums for insured persons who have insured vehicles:

- a. If the insured had concluded insurance with a duration of less than one year, this insurance is not taken in the next year of insurance as a basis for granting a discount, regardless of the fact that no damage was reported.
- b. If the insured had reported one damage in the previous period, then in the next insurance year he loses the right to the bonus in full.
- c. viii. It is considered that the damage is not reported if it is liquidated within 3 years without compensation or is reimbursed in full on any basis, if the insured compensates the damage, if the damage is caused by a driver who drives a vehicle without authorization of the owner-insurer or is not families of the insured driver.
- d. If the insurance was terminated, the insured is entitled after the insurance terminated for the same vehicle or the vehicle he replaced, the right to the same bonus if termination of insurance occurred before the end of the insurance year and if the termination did not last longer than two years. If there was a termination of insurance after the end of the insurance year in which no damage was reported, and the damage was not reported in the period of termination of insurance, the insured is entitled to a bonus as if the termination provided that the interruption did not last longer than two years. In all other cases, after the termination of the insurance, the insured loses the right to the bonus, ie the premium is calculated in terms of the relevant provisions on malus as if there was no termination.
- e. In the case of stolen insured vehicle, the right to the bonus payment is not transferred to the new owner or new user of the vehicle, except when transferring ownership of the vehicle to a close family member, whether it is a transfer of own-

- ership of the same vehicle or purchase of a new vehicle.
- If the insured driver, after the vehicle damage, sale, etc., of the previously insured another vehicle, the realized right to the bonus, ie the obligation to pay the malus, passes to this other vehicle if it is a vehicle from the same premium group, the bonus is calculated from the insurance premium for the new vehicle.
  - Replacement of destroyed, sold, etc. vehicles must be completed within two years.
  - An insured person who has earned the appropriate bonus and purchased another vehicle from the same premium group does not have to sell the first vehicle in order to earn the same bonus with the newly purchased vehicle.
  - If an insured driver loses the bonus on one of the two vehicles because he caused damage to a third party, the insured retains the already recognized bonus for the vehicle with which he did not cause damage to a third party.
  - The insured is entitled to a bonus, i.e., the malus will be calculated on the basis of insight into the previous policy of another insurer, written statements of the insured on the previous duration of insurance and the number of consecutive years without damage and insight into the insurer's records of damages.

- mium without bonuses and malus is calculated.
- The joint stock company-insurer does not have data on damages and changes for at least 3 previous years of insurance because the policyholder was not previously insured for a sufficiently long period, then to determine the bonus and malus use available data for two years and one year insurance.
  - The paid claims, which is placed in relation to the collected premium, must be reduced by the amount of collected recourses on any basis before calculating this ratio.
  - In the case of an insured person with 6 or more insured vehicles, the calculation of the bonus or malus is performed on the basis of a single ratio of paid claims and collected premium for all his insured vehicles.
  - The provisions on determining the premium depending on the technical result shall apply only to policyholders who are 31.12. in the past calendar year had insured more than 5 vehicles.
  - The insurer and the policyholder have the right to request a recalculation of the bonus or malus if he subsequently determined that the calculation was based on claims that are unfounded. Automation of the process of calculating the bonus and malus

**Determining the insurance premium for insured persons who have concluded insurance for six or more vehicles.**

- Bonus, ie malus on these bases is also calculated on vehicles purchased by the insured in the current insurance year.
- In the event of termination of insurance and re-conclusion of the insurance contract, the insurance contractor with 6 or more vehicles is charged a bonus or malus based on the result of the last three calendar years of insurance. If the interruption lasted more than 2 years, a pre-

**AUTOMATE THE BONUS AND MALUS CALCULATION PROCESS**

The process of automating the calculation of bonuses and malus can be automated by the user (insurance company) entering certain data about the vehicle, the insured driver, the previous policy as well as other necessary information that will be used by the insurer's records of damages.

**Examples of data currently available to insurance companies**

Sarajevo Insurance company

Sarajevo Insurance company									
Red. br.	Broj Stole	Datum prijave	Datum nastanka	Opisno ime i oznaka vozila	Tip vozila	Registarski broj	Osiguranik	Prezime i ime osiguranika	AMBUJE
1	1 3/10	24/02/10	21/02/10	STOJANOVIC LAMBA	FORD MERCEDES	172 P 788	ŠENKO JORAN	20011111111111111111	10/02/10 2 500 00
2	2 4/10	05/07/09	05/07/09	DELACIUC BRJUN	FORD FIAT	129 P 734	MALICIA DRAGANA	10000111111111111111	10/02/10 1 500 00
3	4 3/10	06/11/09	24/02/10	BURISIC DUSKO	FORD VIV FREIGHT	064 P 746	TOPIR ZORAN	10000111111111111111	10/02/10 2 211 00 osiguranik
4	6 4/10	24/06/10	24/06/10	FRANCIJ JAROSAV	FORD FORD FREIGHT	126 P 470	BARBOSIĆ MIROSLAV	10000111111111111111	10/02/10 1 500 00
5	6 6/10	06/11/09	06/06/09	KOČIĆ NEJAD	LADA 110	250A 470	DRACULJEVIC MLADEN	10000111111111111111	10/02/10 49 732 00
6	7 3/10	06/11/09	21/02/10	POPONIC SLOBODA	RENAULT 5	25A 002	KRALJICMIRO	10000111111111111111	10/02/10 500 00
7	8 6/10	06/11/10	06/11/10	KALIC SLOBODA	FORD FORD ORAN	032 J 388	BOGOTIĆ ZORAN	10000111111111111111	10/02/10 700
8	9 6/10	07/02/09	07/02/09	TOĐORAC SLOBODA	FORD FORD ORAN	100A 000	ŠTAMBOVIĆ MILAN	10000111111111111111	10/02/10 1 500 00
9	10 6/10	07/02/09	07/02/09	LORENTIĆ SLOBODA	NISSAN MICRA	24 0 0 0	TOPIR MIROSLAV	10000111111111111111	10/02/10 4 500 00 osiguranik
10	12 10/10	07/02/09	07/02/09	BLAZIĆ SLOBODA	FORD CIVIL RACET	10 0 0 0 0	BLAZIĆ SLOBODA	10000111111111111111	10/02/10 3 000 00
11	13 10/10	06/11/10	07/02/09	SOPTIĆ MAJDA	FORD CIVIL RACET	02 0 0 0 0	SOPTIĆ MAJDA	10000111111111111111	10/02/10 500 00 osiguranik osiguranik

Jahorina Insurance company

Jahorina Insurance company									
Red. br.	Broj Stole	Datum prijave	Datum nastanka	Opisno ime i oznaka vozila	Tip vozila	Registarski broj	Osiguranik	Prezime i ime osiguranika	AMBUJE
1	001 100/10	01/11	06/11/2010	STOJANOVIC LAMBA	Mercedes	172 P 788	ŠENKO JORAN	20011111111111111111	10/02/10 2 500 00
2	002 100/10	02/11	06/11/2010	DELACIUC BRJUN	Ford	129 P 734	MALICIA DRAGANA	10000111111111111111	10/02/10 1 500 00
3	003 100/10	03/11	06/11/2010	BURISIC DUSKO	Ford	064 P 746	TOPIR ZORAN	10000111111111111111	10/02/10 2 211 00 osiguranik
4	004 100/10	04/11	06/11/2010	FRANCIJ JAROSAV	Ford	126 P 470	BARBOSIĆ MIROSLAV	10000111111111111111	10/02/10 1 500 00
5	005 100/10	05/11	06/11/2010	KOČIĆ NEJAD	Lada	250A 470	DRACULJEVIC MLADEN	10000111111111111111	10/02/10 49 732 00
6	006 100/10	06/11	06/11/2010	POPONIC SLOBODA	Renault	25A 002	KRALJICMIRO	10000111111111111111	10/02/10 500 00
7	007 100/10	07/11	06/11/2010	KALIC SLOBODA	Ford	032 J 388	BOGOTIĆ ZORAN	10000111111111111111	10/02/10 700
8	008 100/10	08/11	06/11/2010	TOĐORAC SLOBODA	Ford	100A 000	ŠTAMBOVIĆ MILAN	10000111111111111111	10/02/10 1 500 00
9	009 100/10	09/11	06/11/2010	LORENTIĆ SLOBODA	Nissan	24 0 0 0	TOPIR MIROSLAV	10000111111111111111	10/02/10 4 500 00 osiguranik
10	010 100/10	10/11	06/11/2010	BLAZIĆ SLOBODA	Ford	10 0 0 0 0	BLAZIĆ SLOBODA	10000111111111111111	10/02/10 3 000 00
11	011 100/10	11/11	06/11/2010	SOPTIĆ MAJDA	Ford	02 0 0 0 0	SOPTIĆ MAJDA	10000111111111111111	10/02/10 500 00 osiguranik osiguranik

As can be seen in the attached data, each insurance company uses a different date / time format as well as the data in the last column 'Napomena' where it is impossible to determine the status of the incident. The possibility of error in searching for data and information necessary for calculating bonuses and malus is high.

The second problem is calculating bonuses and malus. The accuracy of the calculated data is directly related to the ability and experience of the insurance company's staff.

**Existing system - definition of columns in the spreadsheet**

XCel columns	Description
XCel columns	Description
Incident number	Incident number in the Insurance Company
Damage number	Damage number in the Insurance Company
Damage date reported	Date of damage reported
Damage date	Date of damage
Insured-policyholder	Insured-policyholder
Name and surname / company name	Name and surname / company name
JMBG/JIB – policyholder	Policyholder JMBG/JIB
Vehicle type	Details of the vehicle involved in the incident
Vehicle registration	Vehicle registration number
Damages claim driver	Driver to claim damages
Name and surname / company name	Name and surname / company name
JMBG/JIB - Damages claim driver	Damages claim driver JMBG/JIB
Driver who drove the vehicle	The person who drove the vehicle
Insurance policy number	Insurance policy number in Insurance company
Vehicle chassis	Vehicle chassis number
Amount of damage	Amount of damage in KM
Comments	Incident comments

**New system proposal**

1. Designing a database (hereinafter DB) and defining DB objects.
2. Design a process to transfer data from Xcel spreadsheet to DB.
3. Designing and defining parameters for entering the necessary information for the calculation of bonuses and malus.
4. Designing the process for calculating bonuses and malus based on the entered parameters (Input).
5. Design and method of displaying output parameters to the user (Output).
6. Database - Data base design

**Database design**

SQL Server 2012 Management studio will be used to design DB structure and other DB Objects.

DB name: INSURANCE DB schema name: AUTO DB TABLES:

Table name	Description
InsuranceProvider	Insurer – Insurance Company
IncidentStageDetail	Progress and incident resolution
IncidentStage	Possible progress of the incident
IncidentOsiguranik	Insured details
IncidentClaimDriver	Details of damage claim driver
IncidentDriver	Incident driver
IncidentComment	Incident comments
IncidentVehicle	Vehicle details

**InsuranceProvider**

Column Name	Data Type	Allow Nulls
InsuranceProviderId	smallint	<input type="checkbox"/>
Name	nvarchar(50)	<input type="checkbox"/>
FullName	nvarchar(100)	<input checked="" type="checkbox"/>
Address	nvarchar(50)	<input checked="" type="checkbox"/>
ContactName	nvarchar(50)	<input checked="" type="checkbox"/>
ContactNumber	nvarchar(50)	<input checked="" type="checkbox"/>
Email	nvarchar(50)	<input checked="" type="checkbox"/>
Town	nvarchar(150)	<input checked="" type="checkbox"/>
TownPostCode	nvarchar(25)	<input checked="" type="checkbox"/>

The InsuranceProvider table contains all registered and active insurance companies. A list of all insurance companies can be found in AZOBiH and AZORS. Insurance Agency in BiH - <http://www.azobih.gov.ba/> RS Insurance Agency - <http://www.azors.rs.ba/azors/index.html>

**IncidentVehicle**

Column Name	Data Type	Allow Nulls
IncidentVehId	int	<input type="checkbox"/>
VehicleType	nvarchar(100)	<input checked="" type="checkbox"/>
RegistrationNo	nvarchar(25)	<input checked="" type="checkbox"/>
ChasseNo	nvarchar(100)	<input checked="" type="checkbox"/>
Active	bit	<input type="checkbox"/>

IncidentVehicle table contains information about the vehicle that participated in the damage. The owner of these vehicles is a natural or legal person who is a participant in the incident and the damage.

**IncidentInsuredDriver**

Column Name	Data Type	Allow Nulls
IncidentOsigId	int	<input type="checkbox"/>
OsigName	nvarchar(200)	<input checked="" type="checkbox"/>
OsigJMBG/JIB	nvarchar(50)	<input checked="" type="checkbox"/>
PolicyNumber	nvarchar(50)	<input checked="" type="checkbox"/>
Active	bit	<input type="checkbox"/>

IncidentInsuredDriver table contains information about the natural person who drove the vehicle and was



a participant in the incident and damage

**IncidentClaimDriver**

Column Name	Data Type	Allow Nulls
IncidentOstId	int	<input type="checkbox"/>
OstName	nvarchar(200)	<input checked="" type="checkbox"/>
OsigJMBGIBB	nvarchar(50)	<input checked="" type="checkbox"/>
PolicyNumber	nvarchar(50)	<input checked="" type="checkbox"/>
Active	bit	<input type="checkbox"/>

IncidentOstecen table contains data on the natural person who was a participant in the incident (the so-called third party).

**IncidentDriver**

Column Name	Data Type	Allow Nulls
IncidentDrilnd	int	<input type="checkbox"/>
DriverName	nvarchar(200)	<input checked="" type="checkbox"/>
PolicyNumber	nvarchar(50)	<input checked="" type="checkbox"/>
Active	bit	<input type="checkbox"/>

IncidentDriver table contains information about the individual who was driving the vehicle at the time of the incident and the damage done.

**IncidentComment**

Column Name	Data Type	Allow Nulls
IncidentComId	int	<input type="checkbox"/>
Comment	nvarchar(200)	<input checked="" type="checkbox"/>
Active	bit	<input type="checkbox"/>

IncidentComment table contains notes and comments related to the incident and damage.

**IncidentDetail**

Column Name	Data Type	Allow Nulls
IncidentDetId	int	<input type="checkbox"/>
InsuranceProviderId	smallint	<input type="checkbox"/>
IncidentNumber	nvarchar(100)	<input checked="" type="checkbox"/>
IncHappend	datetime	<input checked="" type="checkbox"/>
IncRecorded	datetime	<input checked="" type="checkbox"/>
DamagedCost	decimal(9, 2)	<input checked="" type="checkbox"/>
IncidentOsigId	int	<input type="checkbox"/>
IncidentOstInd	int	<input type="checkbox"/>
IncidentDrilnd	int	<input type="checkbox"/>
IncidentVehInd	int	<input type="checkbox"/>
IncidentComInd	int	<input type="checkbox"/>
LogDate	datetime	<input type="checkbox"/>
LogUserId	int	<input type="checkbox"/>
Active	bit	<input type="checkbox"/>

IncidentDetail table contains information about the incident and the damage.

**IncidentStage**

Column Name	Data Type	Allow Nulls
IncidentStalId	int	<input type="checkbox"/>
Stage	nvarchar(50)	<input type="checkbox"/>
Active	bit	<input type="checkbox"/>

IncidentComment table contains static data on possible types of progress.

**IncidentStageDetail**

Column Name	Data Type	Allow Nulls
IncidentStageDetId	int	<input type="checkbox"/>
IncidentStalId	int	<input type="checkbox"/>
IncidentDetId	int	<input checked="" type="checkbox"/>
StageComment	nvarchar(200)	<input checked="" type="checkbox"/>
DateLog	datetime	<input type="checkbox"/>
Name	nvarchar(50)	<input type="checkbox"/>
Active	bit	<input type="checkbox"/>

IncidentComment table sadrži podatke o progresu rješavanja incidenta.

IncidentComment table contains information on the progress of resolving the incident.

**Database diagram and relationships between tables**



## FRONT-END APPLICATION (APPLICATION DESIGN)

### User Registration, Sign-In and Login

Register

Sign in

### New user registration

Register

Registration of a new user is a condition that the user of the application can access and use the application. When creating a 'username' and password, the user must have an active email address which will also be a 'username'. To register, the user should click on the 'Register' button:

The registration of a new user requires the following mandatory fields:

- a. Email
- b. Password
- c. Confirm new password
- d. I accept the privacy policy and terms of use

Field	Field description	Fild type	Required field
Email	Email address must be active	Data field	YES
Password	The password must have at least one uppercase letter, one number and the rest of the letters.	Data field	YES
Confirm new password	It must be the same as Password	Data field	YES
I accept the privacy policy and terms of use	The user must click on the check box to accept the privacy policy and terms of use which can be read if the user clicks on the link below.	Check box	YES

When the user clicks on 'Continue' the application will send an email to the user's address to activate the registration.



When the user clicks the middle button, the registration is complete and the user can use the application.

### User login (log-in)

To log in, the user needs to feel requested fields and click on the 'Log in' button.

### User registration fields:

Field	Field description	Fild type	Required field
Email	Email address	Data field	YES
Password	Password registered through activation app	Data field	YES

When the user logs in, the application will automatically recognize which insurance company the user belongs to and where the details of the incidents and damages will be related.

**Cumulative Incident Book- Window for incident entry (damages)**

All fields shown in the figure above for entering incident (damage) data must be the same as the fields in the database where each field must have the same data-type and length.

The status of the incident can be changed and each time a new status is saved in the table: IncidentStageDetail. JIMBG / JIB where the field-type numeric length is 13 digits long.

The Status could be:

- REGISTERED
- REJECTED
- REDEMPED
- REGRESSED
- IN PROCESS

Processes when entering data in the Cumulation Incident Book:

1. The user of an insurance company may create, change and list all incidents, but only incidents related to his own insurance company.
2. When the user enters the data on the incident (damage) for the first time, the status will not be displayed on the window 'Cumulative incident book'. The system will automatically assign the status 'LOGIN'.
3. Change (update) incident data is possible only if the incident is in the status 'REPORTED'.
4. Only when the status of the incident is 'REPORT-ED' is it possible to change (update) all the data in the fields except the Status of the incident.
5. Search for the incident is possible through:
  - a. Damage number
  - b. Date of input (from date to date)
  - c. Date of incident (from date to date)
  - d. Name of the insured or JMBG / JIB
  - e. Name of the third party or JMBG / JIB
  - f. Insured policy number
  - g. Vehicle / chassis registration number

When an incident is found, a new window will allow user to change the status of the incident.

6. Incident-related data cannot be changed if the status changes from status 'REPORTED'.
7. The new Incident Status is linked to the incident with the user's name and date of incident.
8. It is not possible to change the incident back to the status 'REPORTED'.
9. The system will automatically archive incidents and damages that are more than 5 years old from the date of the incident from the search date for incidents and damages in the Incident book.

**REPORTS**

Reports are usually made at the request of the user of the application with the principles to show the necessary results that are important for the further implementation of the process or presentation.

**Damage report - IncidentReport\_1**

This report presents data on the damage found in the book of pests with the status 'REJECTED'.

Osiguravajuće_Drustvo	Broj_štete	Datum_prijave	Datum_prijave	Osiguranik	Osiguranik_JMBG_JIB	Osiguranik_Broj_polise	Oštećeni	Oštećeni_JMBG_JIB	Oštećeni_Broj_polise
Aura	MIP 5666666	2012-10-10	2012-10-15	Šegrt Simo	2202977104326	60010736	Lukic Duška	2202977104326	60010736
Registarski_broj	Broj_šasije	Vozac_vozilom	Vozac_Broj_polise	Iznos_štete	Napomena	Proces_incidenta			
J69-A-258	VF7XS9HUC64221548	STANIŠIĆ CO D.O.O Bjeljina	17001285133	2900.00	Materijalna šteta	REJECTED			

**Incident progress report (damage)– IncidentReport\_2**

This report presents data on the damage found in the Incident book including all incident statuses.

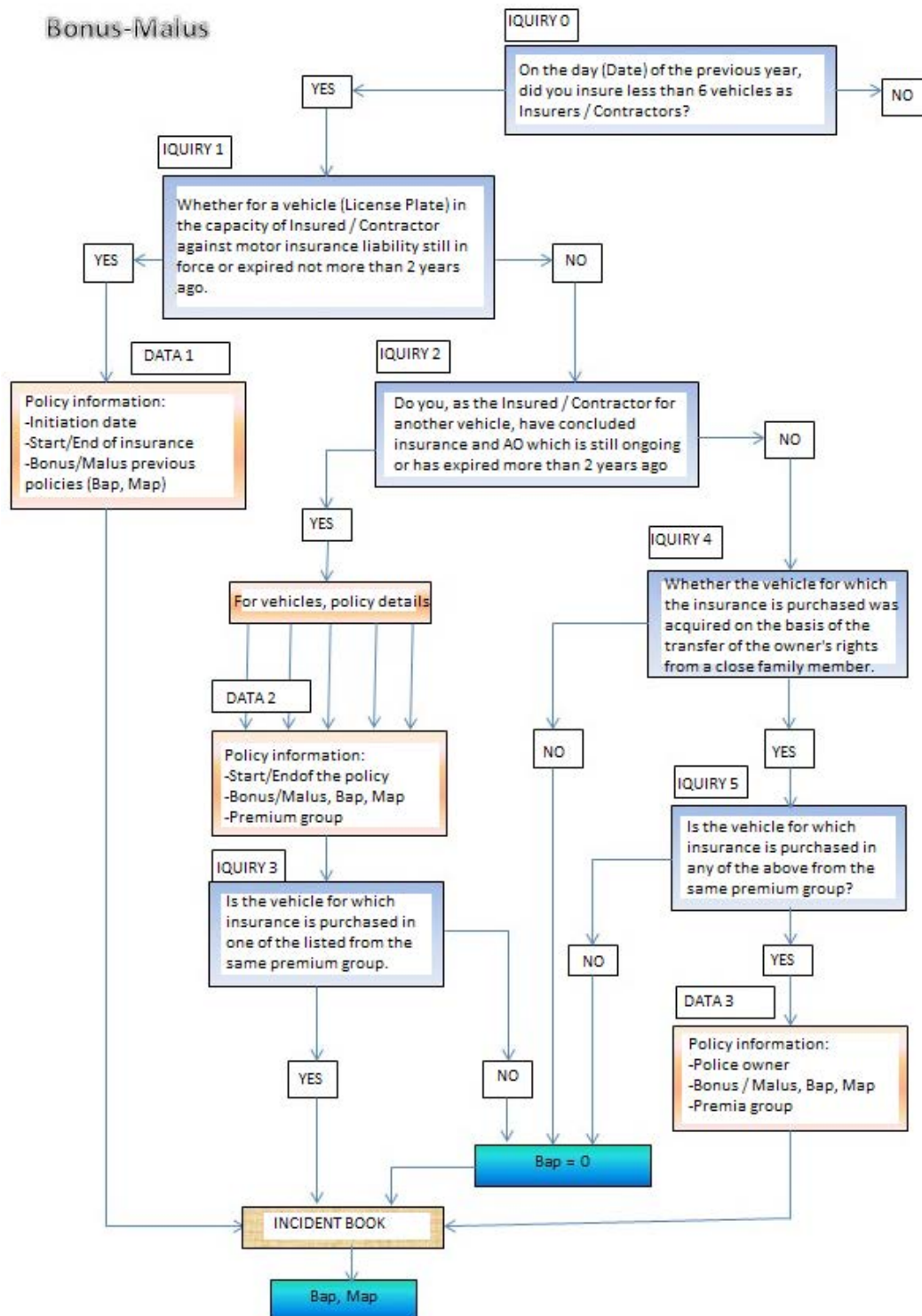
Osiguravajuće_Drustvo	Broj_štete	Datum_prijave	Datum_prijave	Osiguranik	Osiguranik_JMBG_JIB	Osiguranik_Broj_polise	Oštećeni			
Aura	MIP 777766666	2011-01-29	2011-05-09	Obrenovic Mirjana	2510986158966	60010701	Peljo Muradif			
Oštećeni_JMBG_JIB	Oštećeni_Broj_polise	Registarski_broj	Broj_šasije	Vozac_vozilom	Vozac_Broj_polise	Iznos_štete	Napomena			
2510986158966	60010701	A94-T-824	WKK32600001030968	Goran Maric	60010120	2900.00	Materijalna šteta			

Osiguravajuće_Drustvo	Broj_štete	Proces_incidenta	Log_datum	Log_ime
Aura	MIP 777766666	REGISTERED	2011-01-29 14:24:24.463	Rada Broz
Aura	MIP 777766666	IN PROCESS	2011-02-18 14:24:24.463	Ante Miric
Aura	MIP 777766666	REJECTED	2012-10-21 14:24:24.463	Mirsad Omeragic

## PROCESSES AND FLOW CHART (DIAGRAM) FOR CALCULATING MALUS AND BONUS

### Process description and diagrams

Since AZOBiH and AZORS plan to exclude legal obligations for 6 or more vehicles, the process of calculating malus and bonus in this case will not be considered.





**Bonus and Malus Calculation - Window for entering insured data and other necessary details for calculating malus and bonus**

The type of insured person can be a person or a legal entity. If he is a person, then it is necessary to enter the JMBG number, otherwise the JIB number.

**Collection of necessary data for bonus and malus calculation**

The default will be the 'radio button' - Yes.

If the user clicks on the 'push-button' - Continue, the 'pop-up' window "IQUIRY 1" opens

**a) IQUIRY 1**

**b) DATA 1**

If in the window "IQUIRY 1" the user selects 'Yes'

After the window "DATA 1", the data in Incident book is searched and based on the found data, the calculation of the Bonus and Malus is performed.

**c) IQUIRY 2**

If in the window " IQUIRY 1" the user selects "No".

**d) DATA 2**

If the user has selected 'Yes' then the 'pop-up' window 'DATA 2' opens.

After the 'pop-up' window "DATA 2" the 'pop-up' window "IQUIRY 3" opens.

**e) IQUIRY 3**

If the answer is 'Yes', the data in the Incident book is searched and based on the found data, the calculation of Bonus and Malus is performed. If the answer is 'No',

then the Bonus is zero (0) and the Insured is not entitled to the Bonus. In addition, the data in the incident book is searched and based on the found data, the calculation of Malus is performed.

#### f) *IQUIRY 4*

If the answer is 'No' in IQUIRY 2 then a new query 'IQUIRY 4' appears.

If the answer is 'No', then the Bonus is zero (0) and the Insured is not entitled to the Bonus. In addition, the data in the incident book is searched and based on the found data, the calculation of Malus is performed.

If the answer is 'Yes' then the 'pop-up' window "IQUIRY 5" opens.

#### g) *IQUIRY 5*

If the answer is 'No', then the Bonus is zero (0) and the Insured is not entitled to the Bonus. In addition, the data in the incident book is searched and based on the found data, the calculation of Malus is performed. If the user has selected 'Yes' then the 'DATA-2' pop-up window opens. After the window "DATA 2", the data in the incident book is searched and based on the found data, the calculation of Bonus and Malus is performed.

## CONCLUSION

This scientific work (document) defines and summarizes the shortcomings in the existing system of manual search and determination of bonuses and malus in the records of insurers on damages (Incident book).

A new system model has been designed including:

1. Designing a database on Sql Server
2. Data update processes

3. Facilities for access to the system via the Internet
4. Data entry facilities necessary for the calculation of bonuses and malus

This new model is a system that uses a more modern approach in collecting, processing and accessing damage data. Thus, the new system eliminates existing shortcomings in the processing and inspection of insurer's claims records. Each insurance company has access to a central database via the Internet where it will enter and update insurer data on claims of its own organization. Every insurance company owns the same data. The insurance agency is the data administrator and thus provides a more effective way to monitor the data that insurance companies update. The update of the data is in real time, that is, the entry of new data is immediately after receiving the data on the damage. This eliminates the error in late entry of damage data and thus the accuracy of data in determining bonuses and malus.

Searching for data and determining bonuses and malus is enabled via the Internet, which allows insurance companies mobility and flexibility to use web services and access data remotely. The new system is completely flexible and through the Web service it is possible to use in other systems where parameters such as bonus and malus are required.

The database and processes for automatic bonus calculation are designed on Sql Server, which enables the purchase of insurance policies online.

In short, the new system provides the following:

1. Uniqueness and uniqueness of data for all insurance companies (data standard)
2. Centralization of data and the ability to access multiple users to the system at the same time
3. Accuracy of entered data and fast data search
4. Ability to monitor progress of incident resolution (Stage)
5. Ability to track who and when entered data on damages and incidents
6. Possibility of archiving damages and incidents that are not active in the process of determining bonuses and malus
7. Easier use of the system
8. Printing reports as well as printing evidence of bonus and malus
9. Access and search data via the Internet
10. Better data protection. Currently, the data is sent to the CD by mail or/and email.

## LITERATURE AND WEB LINKS

- [1] Information Technologies and Entrepreneurship of the University of Mostar, Dragan Mihic (Increasing the efficiency of the process of determining bonuses and malus in contracting auto liability insurance).
- [2] Insurance Agency in BiH - <http://www.azobih.gov.ba/>
- [3] Insurance Agency in RS - <http://www.azors.rs.ba/azors/index.html>
- [4] Microsoft SQL Server Management Studio2012 - <http://technet.microsoft.com/en-gb/>