STUDY OF CLEAN WATER DISTRIBUTION SERVICES FROM BAHSIKAM SPRINGS IN PDAM TIRTAULI, PEMATANGSIANTAR CITY

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Abstract

StudyThis study aims to determine the service of distribution of clean water from the Bahsikam spring at PDAM Tirtauli, Pematangsiantar City, especially for the Siantar Marihat sub-district. Where the sample is 100 people. It is known that there is a significant influence between the variables of water color (X1), water odor (X2), water odor (X3) and water pressure (Continuity) on consumer satisfaction (Y) in PDAM Tirtauli, Pematangsiantar City. Based on the table above, the partial test results state that the variable smell of water (X1), taste of water (X2) and color of water (X3) can be seen by comparing the significance value of the variable with α = 5%, so if the significance value is <0.05, the variable is partially independent. significant effect on the independent variable. As for Continuity,The known R Square value is0.993 or 99.3 %indicates that the variable job satisfaction (Y) is affectedthe smell of water (X1), the taste of water (X2) and the color of water (X3),99.3% and the remaining 7% are influenced by variables not examined.in this research.

***Keywords:*Water Quality, Continuity, Consumer Satisfaction**

INTRODUCTION

Awater is a very important requirement for human survival, without water there will be no life on earth. 65% of the human body consists of water. Earth contains a large amount of water, approximately M1.4 x 109 km3, which consists of oceans, seas, rivers, lakes, icebergs, and so on. However, of all the water contained on earth, only 3% is fresh water which is found in rivers, lakes and groundwater.can be used directly by humans

Of the 40 million cubic millimeters of water that is on earth, whether it is water that is inside or on its surface, it turns out that no more than 0.5% or 0.2 million cubic miles can be directly used for human needs. The remaining 97% is in the form of seawater or other types that contain high salt, and 2.5% is in the form of eternal snow ice which is in a new melting state.

Karengiven the importance of the need for clean water, it is only natural that the clean water sector will receive priority treatment because it involves the lives of many people. Handling the fulfillment of clean water needs can be done in various ways, adjusted to the existing facilities and infrastructure.

According to PP RI Number 16 of 2005 concerning. Development of a Drinking Water Supply System, drinking water supply is an activity of providing drinking water to meet the needs of the community in order to have a healthy, clean and productive life. The

design of a drinking water supply and distribution system from raw water sources must meet the requirements for quality, quantity and continuity to the community.

Given the great urgency of water for human life, the more the population increases, the greater the need for water. So the need for human life for water will continue to increase, both for household needs, for factory/industrial needs, office needs, schools and for agriculture will also increase. On the other hand, water sources are starting to be limited and even tend to decrease due to factors originating from human activities, such as deforestation, natural damage, reduction of water catchment areas, density of buildings/residential houses, land contours and pollution.

To deal with the problem of providing clean water, if the Regional Drinking Water Company (PDAM) is present as a solution, especially for the people of Pematang Siantar City who depend a lot on PDAM for their water sources. The municipality of Pematang Siantar is an autonomous region which has a regional company engaged in the field of clean water services, named PDAM Tirtauli. PDAM Tirtauli as a Level II Regional Company of the Municipality of Pematang Siantar was founded in 1978 where this company has a general function to prioritize profits for the creation of regional development in the economic sector and also has a special function as a social function for its position in the region.

In urban areas in particular, people really need the availability of drinking water for human needs and also for other needs. In relation to development, urban physical form must be linked to development in the field of drinking water, so that the development carried out can provide multiple interrelated benefits, namely urban development accompanied by drinking water infrastructure facilities. Apart from that, the development of the urban environment also really needs the provision of sufficient clean water for landscaping, fire hazards, cleanliness and so on.

Likewise with the people of Pematang Siantar Municipality whose population is increasing every year, as well as the high activity of the people of Pematang Siantar City in the economic, social, educational, transportation, industrial and other fields, in dire need of clean water and drinking water facilities. This is a big responsibility for the local regional government to be able to handle all the needs of the community so that development in one area is realized in a more advanced direction. The higher the standard of living, the higher the human need for water. To be more clear, we can observe the table of standard water requirements as follows:

Table
Clean Water Requirement Standard

City Category	Total Population	Standard (liters/person/day)
Metropolis	>1,000,000	170 – 190 L/person/day
Big city	500,000 to < 1,000,000	150 – 170 L/person/day

Medium city	100,000 to < 500,000	130 – 150 L/person/day
Small town	20,000 to < 100,000	100 – 130 L/person/day
District town	3.000 to < 20.00	90 – 100 L/person/day

Source: Directorate General of Human Settlement, Ministry of Public Works, 2007:45

From table 1.1 above it can be seen that the higher the city category, the greater the level of community need/dependence on water. This is ideally compared to the population of Pematang Siantar City, especially in 2020, namely in table 1.2. as follows:

Table

Residents of Pematang Siantar City in 2020

No	District name	Wide km2	Total population
1	SIANTAR MARIHAT	7.8250	24,609
2	SIANTAR MARIMBUN	18.0060	21,512
3	SOUTH SIANTAR	2.0200	23,072
4	WEST SIANTAR	3.2050	47,976
5	NORTH SIANTAR	3,6500	62,424
6	EAST SIANTAR	4.5200	49,013
7	SIANTAR MARTOBA	18.0220	55,069
8	SIANTAR SITALASARI	22.7230	37,775
PEMATTANGTSIANTAR		79,971	321,450

Source of the 2020 Pematangsiantar Statistics Agency

From the table. above, then Pematangsiantar City with

the total population of 321,450 people in 2020 requires ± 55,796,090 liters of clean water/day. This amount is obtained from the number of residents multiplied by the number/basic needs of the population for the classification of a medium city (130 liters/person/day). When compared in terms of the population density of Pematang Siantar City in 2020, Pematangsiantar City has an area of 79.97 km2.

CService coverage at PDAM Tirta Pematangsiantar is currently still at 75% where there are still many who have not got clean water sources in the Pematangsiantar area. Bahsikam is one of the major springs from PDAM which is distributed to the community as a source of drinking water from springs. Where the bahsikam drains its water for many kilometers away. The source of the Bahsikam eye drains water from a clean spring that has been filtered and circulates the water to residential areas, namely around the Siantar Marihat District area.

Forthis problem, it is deemed necessary to know the amount of clean water demand in the city of Pematangsiantar, especially in the Siantar Marihat District at present and in the future, as well as to find out how far the service level of the drinking water distribution network is from the bahsikam spring water company Regional Drinking Water Company (PDAM) serves the needs of the community at this time so that in the future the Regional Drinking Water Company (PDAM) can improve its services, thus it is expected that the amount of clean water produced by the Regional Drinking Water Company (PDAM) of Pematangsiantar City can provide all the needs of the community.

LITERATURE REVIEWS

Water

To meet all human needs for clean water, raw water sources are needed that can be processed into clean water. The raw water in question, of course, has certain requirements that must be met in order to be processed into clean water. Here are some definitions of the types of water.

According to SNI (0004: 2008) Raw water is water that comes from surface water sources, groundwater basins or rainwater that meets certain quality standards as raw water for drinking water.

According to the Regulation of the Minister of Public Works No. 18 of 2007 Standard water for household drinking water, so-called raw water is water that can come from surface water sources, groundwater basins or rainwater that meets certain quality standards as raw water for drinking water.

Meanwhile, according to the Regulation of the Minister of Health of the Republic of Indonesia Number 492/MENKES/PER/IV/2010 concerning water quality requirements, drinking water is that which goes through a management process or without a management process that meets health requirements and can be drunk immediately.

Satisfaction

Satisfaction is a person's feeling of pleasure or disappointment that arises after comparing their perceptions/impressions of the performance (or results) of a product and their expectations. Job satisfaction is a function of perceptions/impressions of performance and expectations. If performance falls below expectations, the customer is dissatisfied. If performance meets expectations, the customer is satisfied. If performance exceeds expectations, the customer is highly satisfied.

According to Kotler (2006: 153), satisfaction is a person's feeling of pleasure or disappointment that arises after comparing the perception/impression of the performance (or results) of a product and their expectations. Job satisfaction is a function of perceptions/impressions of performance and expectations. If performance falls below expectations, the customer is dissatisfied. If performance meets expectations, the customer is satisfied. If performance exceeds expectations, the customer is highly satisfied.

According to Barnes (2003: 153), satisfaction is a customer's response to the fulfillment of needs. This means the judgment that certain forms of privilege of goods or services themselves provide a level of comfort associated with meeting certain needs.

Meanwhile, according to Indra (2011: 43), customer satisfaction with a product or service is actually something that is difficult to obtain if the service company or industry does not really understand what consumers expect. For products or services with the same quality, it can provide different levels of satisfaction for different consumers.

From the various opinions expressed by experts, it can be concluded that the definition of customer satisfaction is the response to the behavior shown by the customer by comparing the perceived performance or results with expectations. If the results are felt below expectations, then the customer will be disappointed, dissatisfied and even dissatisfied, but if it is in accordance with expectations, the customer will be satisfied and if the performance exceeds expectations, the customer will be very satisfied.

METHODS

Method of collecting data

The research data collection method is a way to collect relevant data for research. In this study the techniques used are as follows:

1. Primary data

The primary data in this study were obtained using the following data collection techniques:

a) List of Questions (Questionnaire)

Namely by making a list of questions in the form of a questionnaire aimed at the sample, namely the Siantar Marihat sub-district community who use the services of PDAM Tirtauli Pematangsiantar by using a Likert scale in the form of multiple choices & checklist tables, where each question has a choice as shown in the following table:

Likert Scale Table

ANSWER CHOICES	Answer Scale
▪ Strongly agree	5
▪ Agree	4
▪ Disagree	3
▪ Don't agree	2
▪ Strongly disagree	1

`Source Sugiyono (2016)

b) Interview Method (Interview)

The interview method is a method of collecting data by asking questions directly regarding the general description and problems related to the subject matter of the researcher to employees who are authorized to use these data.

c) Observation

The data collection method is complex because it involves various factors in its implementation. Observation data collection methods not only measure the attitudes of respondents, but can also be used to record various phenomena that occur.

2. Secondary data

Secondary data in this study used documentation data collection methods, namely collecting data from companies such as company history and number of employees.

Data analysis method

The analysis technique used in this study is quantitative data analysis, namely testing and analyzing data by calculating numbers and then drawing conclusions from the test with the formulas below.

1. Multiple Linear Regression

Regression analysis is used to determine the effect of the independent variables on the dependent variable. The regression equation in Sugiono (2014, p. 298) is as follows:

$$Y = a + bX$$

Information :

Y	= Customer Satisfaction
a	= Constant
b1,b2 and b3	= regression coefficient
X1	= Smell of Water
X2	= Water Taste
X3	= Water Color

2. Partial Test (t test)

Partial test is used to test whether the independent variable (X) individually has a relationship with variable (Y). To test the significant relationship used statistical test formula t . The following is the t statistical test formula in Sugiyono (2010, p. 184).

$$t = r \frac{\sqrt{n-2}}{\sqrt{1-r2}}$$

Information :

t = calculated t value
r = correlation coefficient
n = the number of rank pairs

Under the condition :

H0 = H0 : rs = 0, meaning that there is no significant relationship between the independent variable (X) and the dependent variable (Y).

Ha: rs ≠ 0, meaning that there is a significant relationship between the independent variable (X) and the dependent variable (Y).

Test criteria:

H0 is accepted if –ttable ≤ tcount ≤ ttable at α = 5%, df = nk

Ha is rejected if tcount > ttable or –tcount < -ttable

3. F test

The F test is used to test the significance of the multiple correlation coefficient. The following is the formula for calculating the F test in Sugiono (2010, p. 192) which is calculated using the following formula.

$$Fh = \frac{R2 / k}{(1-R2) / (n - k - 1)}$$

Information :

R = multiple correlation coefficient
k = number of independent variables
n = number of samples
R2 = predetermined multiple correlation coefficient
F = F count which is then compared with f table

Test conditions:

H0 = There is no effect of water quality on clean water sources

Ha = There is an influence between water quality and clean water sources

Information :

F count = Results of water quality calculations for clean water sources

F table = F value in table F based on water quality for clean water sources

Test conditions:

- It is not significant if H0 is accepted and Ha if fcount<ftable and –fcount>ftable
- It is significant if H0 is rejected and Ha is accepted if fcount> ftable and –fcount< -ftable

4. Coefficient of Determination

This analysis is used to determine how much influence is exerted between the independent variables and the dependent variable which is indicated by the percentage . Here is the formula used:

$$D=R2 \times 100\%$$

Information :

D = Determination
R = Multiple correlation values
100% = Contribution Percentage

RESULTS AND DISCUSSION

Results and Discussion

1. Description of Research Results

In this study, researchers processed data in the form of a questionnaire consisting of 6 statements for the Clean Water variable (Y) 8 for the Service Quality variable (X). by using Likert Summated Rating (LSR).

Table.
Likert scale

Answer Choices	Scale
Strongly agree	5
Agree	4
Disagree	3
Don't agree	2
Strongly Disagree	1

Source: Sugiyono (2012)

And the provisions above apply in calculating work discipline variables and service quality of PDAM Tirtauli Pematangsiantar City for clean water sources.

2. Characteristics of Respondents Based on Gender

The following are the characteristics of the respondents in the Siantar Marihat sub-district community who use clean water sources

Table 4.2
Distribution of Respondents by Gender

No	Gender	Amount	Percentage (%)
1	Man	80 People	80%
2	Woman	20 People	20%
	Amount	100 People	100%

Source: Processed data, 2020

Based on the table above, it can be seen that the respondents consisted of 80 men (80%) and 20 women (20%) out of a total of 100 respondents who used clean water from PDAM Tirtauli Pematangsiantar.

3. Characteristics of Respondents Based on Age

The following are the characteristics of the respondents in the Siantar Marihat sub-district community who use clean water sources

Table
Distribution of Respondents by Age

No	Age	Amount	Percentage (%)
1	18-24 Years	12 People	12 %
2	25-28 Years	20 People	20 %
3	29-33 Years	52 People	52 %
4	34-39 Years	16 People	16%

	Amount	100 People	100%

Source: Processed data, 2020

Based on the table above it can be seen that the respondents consisted of 12 people aged 18-24 years or by (12%), 20 people aged 25-28 years or by (20%) 52 people aged 29-33 years or by (52 %) and 16 people aged 34-39 years or by (16%).

4. Characteristics of Respondents Based on Education

The following are the characteristics of the respondents in the Siantar Marihat sub-district community who use clean water sources

Table

Distribution of Respondents Based on Education Level

No	Level of education	Amount	Percentage (%)
1	SENIOR HIGH SCHOOL	30 People	30 %
2	D3	28 People	28 %
3	S1-S3	42 People	42 %
	Amount	100 People	100%

Source: Processed data, 2020

Based on the table above, it can be seen that the respondents consisted of 30 taxpayers with high school education or by (30%), 28 taxpayers with D3 education or by (28%), 42 taxpayers with S1-S3 education or by (42%).

5. PDAM Account Expenses

Based on the results of the survey, each month customers pay Rp. 20,000 – 50,000 for PDAM account payments (42.3%), 26.8% spent less than Rp. 20,000, 24.7% spent between Rp. 51,000 – Rp. 100,000 and only 6% spent more than Rp. 100,000.

6. Water quality

The most sensitive aspects of quality are smell, taste and color. From the existing survey results, it can be seen that more than half of the respondents stated that PDAM water was very odorless, namely 26.8%, most of the people who stated that the PDAM water they received did not smell, namely 53.6%, while 19.6% stated that PDAM water quite smelly.

Table

Smell of PDAM Water from the Basikkam Spring

No	Water quality	Amount	Percentage (%)
1	Very Odorless	30 People	30 %
2	Odorless	60 People	60 %
3	Smelly enough	10 People	10 %
	Amount	100 People	100%

Sumber: Primary data

From laboratory results it is known that the water in the reservoir has no odor. Smell is a parameter that influences customer satisfaction, when associated with statistical results it can be seen that there is a real relationship between customer satisfaction and the smell of water.

Table
Taste of PDAM Water from the Bahsikam Spring

No	Water quality	Amount	Percentage (%)
1	Very Tasteless	64 People	64 %
2	Tasteless	26 People	26 %
3	Taste Enough	8 people	8 %
	Amount	100 People	100%

Sumber: Primary data

In terms of taste, it is known that 64% of the people stated that the water was very tasteless, while most of the people stated that the water was tasteless (26%), but there were 8% who stated that the water they received had quite a taste. The opinions of most customers are in accordance with laboratory results which show that the water distributed has no taste, although there are customers who still state that the water they receive still has taste, this is possible due to taking water from the water reservoir/tub or interference with the water pipes either presence of mildew or corrosion.

Table
PDAM Water Color

No	Water quality	Amount	Percentage (%)
1	Very Colorless	54 People	54 %
2	Colorless	38 People	38 %
3	Simply Colored	8 people	8 %
	Amount	100 People	100%

Source: Primary data

It can be said that smell, taste, color together influence customer satisfaction. Customer satisfaction candescribed by smell, taste, color.

7. Continuity

Based on the results of the community's response, it is known that the majority of 8% of the community stated that PDAM water often does not flow, even 12% said it was very often, while 80%% said it sometimes. From the results of this observation it can be seen that the PDAM flow is not continuous.

Table
Flow Continuity

N	Water quality	Amount	Percentage

o			(%)
1	Very often	8 people	54 %
2	Often	12 People	38 %
3	Cage	80 People	8 %
	Amount	100 People	100%

Sumber: Primary Data

8. Water Pressure Analysis

Pressure is one of the factors that support community satisfaction with PDAM services, based on research results from the community it is known that 50% stated that the water they received was normal pressure, some 28.9% said it was heavy and 22% said the water they received had low pressure.

Table 4.9
PDAM Water Flow Pressure

No	Water quality	Amount	Percentage (%)
1	heavy	28 People	28 %
2	Normal	50 People	50 %
3	Small	22 People	22 %
	Amount	100 People	100%

Source: Primary data

B. System Analysis Based on Satisfaction Supporting Factors

According to the results of a survey conducted on PDAM customers in the study area on public perception of PDAM services, 41.2% of respondents stated that the services provided so far were very unsatisfactory, 39.2% of respondents said they were unsatisfactory, while 19.6% of respondents from PDAM customers state that PDAM services have been satisfactory.

Table
Level of Customer Satisfaction with Clean Water Services

No	Customer satisfaction	Amount	Percentage (%)
1	Very Unsatisfactory	8 people	8 %
2	Not satisfactory	11 People	11 %
3	Satisfying	79 People	79 %
	Amount	100 People	100%

Sumber : Primary data

To measure the level of customer satisfaction with the form of PDAM services, it is necessary to analyze based on the opinions and views of the public. The parameter that becomes an important value is the fulfillment of the requirements in the provision of clean water which includes:

a) Quality, in this case the color, taste and smell of water is a very influential aspect in customer satisfaction.

b) Continuity, which means the availability of water for any time needed (24 hours/day) or at least 12 hours per day during peak hours or in the form of water velocity.
c) Water pressure, which is the coverage of all PDAM service areas or does not cause damage to piping equipment.

C. Multiple Linear Regression Testing

The results of data processing with the SPSS program regarding the influence of work environment variables, teamwork and salary on job satisfaction can be seen in the following table:

The multiple linear regression equation can be seen from the value of the coefficient B in the following table:

Table
Results of Multiple Linear Analysis
Coefficientsa

Model	Unstandardized Coefficients B	Unstandardized Coefficients std. Error	Standardized Coefficients Betas	Q	Sig.
(Constant)	.250	.209		1,200	.234
Smell of Water	.829	.030	.575	27,477	.000
Water Taste	043	014	052	3,149	002
Water Color	399	024	.407	16,832	.000

a. Dependent Variable: Customer Satisfaction

Source: processed data (2020)

From calculations using a computer program and using the SPSS Version 26 application, the results are:

a = 0.250
b1 = 0.829
b2 = 0043
b3 = 0.399

So the multiple linear regression equation for education and work experience on performance is:

Y= 0.250+ 0.829X1 + 0.043X2 + 0.399X3

From the equation above, it can be seen that the relationship between satisfaction and the less smelly, tasteless and colorless PDAM water is, the higher the value of customer satisfaction.

D. Hypothesis testing

1. Partial test (t test)

Partial test (t test) is used to test whether or not there is an effect on water quality including the smell of water (X1), the taste of water (X2) and the color of water (X3) on customer satisfaction (Y). The guideline is used if it is significant > 0.05, then there is no significant effect or Ho is accepted and Ha is rejected and if the probability is significant <0.05, then there is a significant effect or Ho and Ha are accepted. and also done by using a comparison of tcount> ttable then there is a significant influence or Ho and Ha are rejected and if tcount < ttable

then there is no significant effect or Ho is accepted and Ha is rejected.

Table
t test
Coefficientsa

Model	Unstandardized Coefficients B	Unstandardized Coefficients std. Error	Standardized Coefficients Betas	Q	Sig.
(Constant)	.250	.209		1,200	.234
Smell of Water	.829	.030	.575	27,477	.000
Water Taste	043	014	052	3,149	002
Water Color	399	024	.407	16,832	.000

a. Dependent Variable: Customer Satisfaction

Source: Processed Data (2020)

Based on the table above, the partial test results state that the variable smell of water (X1), taste of water (X2) and color of water (X3) can be seen by comparing the significance value of the variable with α = 5%, so if the significance value is <0.05, the variable is partially independent. significant effect on the dependent variable.

2. F test

The provisions are, if the probability value F (sig) in the Anova table < α = 0.05, then Ho is rejected, but if the probability value sig > 0.05 then H0 is accepted. The data needed to test the hypothesis above are as follows:

Table
F test
ANOVAa

Model		Sum of Squares	df	MeanSquare	F	Sig.
1	Regression	582,235	3	194,078,770	3605973	.000b
	residual	3,983	74	054		
	Total	586,218	77			

a. Dependent Variable: Customer Satisfaction

b. Predictors: (Constant),Water Smell, Water Taste, Water Color

Source: Research Data (Processed 2020)

The Fcount value in the table above is3605973with a significance value of 0.000 less than 0.05. Because Fcount equals3605973> Ftable (0.05; 3 vs 74) with df2 = nk (100-4=96) of 2.73 or a significant level of 0.000 <α 0.05 then H0 is rejected, meaning that the smell of water (X1) tastes of water (X2) and water color (X3) has a positive and significant effect on customer satisfaction (Y) PDAM Tirtauli Pematangsiantar.

3. Determination Test (R^2)

To find out the extent of the contribution or percentage of influencemeaning Water Smell (X1) Water Taste (X2) And Water Color (X3)tocustomer satisfaction (Y),then it can be known through the test of determination, namely as follows:

Table
Determination Test
Summary model b

Model	R	R Square	Adjusted R Square	std. Error of the Estimate
1	.997a	.993	.993	.232

a. Predictors: (Constant), Water Odor, Water Taste, Water Color

b. Dependent Variable: Customer Satisfaction

Source: Primary data processed by SPSS Version 26

The known R Square value is0.993 or 99.3 %indicates that the variable job satisfaction (Y) is affectedthe smell of water (X1), the taste of water (X2) and the color of water (X3),99.3% and the remaining 7% are influenced by variables not examined in this study.

CLOSING

Conclusion

From the results of the analysis discussed earlier, the following conclusions can be drawn:

1. There is a significant influence between water quality and customer satisfaction in PDAM Tirtauli Pematangsiantar. The results of regression testing show that the level of significancehas a value of 0.005 which means it is greater than 0.00, which means that the water quality variable has a partial effect on customer satisfaction.
2. Water continuity also has a positive effect on customer satisfaction with springs. Where at this time the customer is not satisfied with the continuity of the water provided by the PDAM where clean water has not been flowing for 24 hours. Continuity is very influential, if continuity is good then customer satisfaction will increase and vice versa if water continuity is lacking then consumer satisfaction will decrease over time customers will switch to drilled water.

Suggestions

Based on the conclusion, because there is a significant influence of water quality and water continuity on customer satisfaction of PDAM Tirtauli Pematangsiantar, this shows that water quality and continuity is something that is very important to increase customer satisfaction, so the authors suggest to the company:

1. As for water quality, currently consumers are satisfied, but in the future there must be maintenance of springs, the better the quality of the water, the more satisfied customers will be with the water source.
2. Indeed, at this time customers are not satisfied with the water continuity, therefore for PDAM Tirtauli, please pay more attention to the source of water that flows to the community, if the water continuity is good then satisfaction will increase.
3. For companies, the results of this study can be used as a consideration to increase customer satisfaction. If water quality and water continuity are improved, customer satisfaction will increase. So it is necessary to make several decisions to pay attention to the continuity and quality of better water so that later customer satisfaction will increase.

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