Variation Analysis Addition of Admixture Consol N10 MB to Concrete Compressive Strength

Gusneli Yanti 1, Zainuri 2, & Shanti Wahyuni Megasari 3

1 Universitas Lancang Kuning, Pekanbaru, 28265, Indonesia
Email: gusneli@unilak.ac.id
2 Universitas Lancang Kuning, Pekanbaru, 28265, Indonesia
Email: zainuri@unilak.ac.id
3 Universitas Lancang Kuning, Pekanbaru, 28265, Indonesia
Email: shanti@unilak.ac.id

Abstract. One of the efforts to improve the quality and quantity of concrete produced is by providing added material to the concrete mixture. PT. Kimia Konstruksi Indonesia produces cosol which is chemical construction of high quality, durable, easy to apply and more economical price. Consol has various types of products with different advantages such as Consol N10 MB is an admixture for high strength concrete. The purpose of this study is to determine the value of concrete compressive strength with the addition of material variations admixture to the N10 MB consol. Concrete design refers to the DoE and SNI 03-2493-1991 methods with cylindrical molds measuring 150 mm x 300 mm. Concrete quality of the K-300 plan with the percentage addition of Consol N10 MB, 0%, 0.1%, 0.3%, 0.5%, 0.8%, 1%, 1.2% and 1.5% with time testing at the age of 28 days. The test results show that the tendency of the average compressive strength graph has increased with the addition of N10 MB to 0.5%, with the highest average compressive strength obtained at the addition of 0.5% N10 MB consol of 369.48 kg / cm$^2$ and the resulting equation is $y = -113.5x^2 + 109.8x + 327.1$

Keywords: Admixture; Consol N10 MB; Compressive Strength of Concrete

1. Introduction

The development of building construction provides demands on building materials technology more effective, fast, economical and environmentally friendly. Providers and users of construction services should be more selective in choosing materials to be used so as to meet the needs for better construction in terms of strength. The condition ultimately requires concrete material to continue to be modified so as to meet the existing demand. One of the efforts to improve the quality and quantity of concrete produced is by providing added material to the concrete mixture.

Admixture materials that circulate in the market have different brands, types and advantages, because it has its own advantages, then the price of the Admixture materials is relatively expensive. PT. Kimia Konstruksi Indonesia produces cosol which is chemical construction of high quality, durable, easy to apply and more economical price. Consol has various types of products with different advantages such as Consol N10 MB is an admixture for high strength concrete.
The purpose of this research is to know the value of compressive strength of concrete with variation of addition of consol N10 MB. Several existing studies are [6] “analyze the influence of percentage variation of Sikament-NN to concrete compressive strength characteristic”. [10] examined the comparative analysis of the addition of consol variation to concrete compressive strength. [8] “analyzed the strong press generated concrete using superplasticizer type Napthalene and Polycarboxilate compared to normal without the use of concrete admixture”. The difference from previous research is the material used and the strong characteristic of the press plan K 300.

2. Theory and Hypotheses (if required)

2.1 Concrete

"Concrete is defined as a mixture of Portland cement or other hydraulic cement, fine aggregate, coarse aggregate, and water, with or without an admixture" [5], whereas according to [2] simple concrete formed by mixed hardening between cement, water, fine aggregate (sand), and coarse aggregates (crushed or gravel). Sometimes added also a mixture of other ingredients (admixture) to improve the quality of concrete.

2.2 Admixture

Based on [1] "admixture or added materials are materials other than water, aggregates and hydraulic cement mixed in concrete or mortar added before or during stirring".

In general, the added ingredients are chemicals admixture and mineral added materials (additive). There are 7 (seven) kinds of chemical additive materials, are:

1) Type A, Water-Reducing Admixtures
2) Type B, Retarding Admixtures
3) Type C, Accelerating Admixtures
4) Type D, Water Reducing and Retarding Admixtures
5) Type E, Water Reducing and Admixtures Accelerating Admixtures
6) Type F, Water Reducing, High Range Admixtures
7) Type G, Water Reducing-High Range Retarding Admixtures

[7] “analyze the study of the effect of variations in the addition of retarder material to the parameters of compacting the concrete with high quality concrete compressive strength, from the test results obtained the admixture of retarder added material of 0.3% of the weight of cement in the mixture of concrete mix gives good results compared to other levels seen from SCC parameter test results are performed on fresh concrete. The higher the retarder level used, the better the workability produced due to the lower concrete viscosity and compressive strength of concrete with retarder levels of 0.2% and 0.3% which were tested at 28 days experienced an increase of 0% compressive strength, then at levels of 0.4% and 0.5% experienced a decrease due to the length of time it takes for the concrete to dry. Overall it can be said that the addition of retarders provides more compressive strength than 0% levels. Maximum compressive strength occurred at the addition of retarder levels of 0.3% with a result of 54.14 MPa and the optimum compressive strength obtained was at 0.32% for 28 days of concrete”.

2.3 Consol N10 MB

According to [9], Consol N10 MB is an environmentally-friendly (admixture) additive that is free from chloride and can reduce large amounts of water. Consol N10 MB comes from sulphonated naphthalene which can work optimally on different types of portland cement. Consol N10 MB in accordance with ASTM C494-92 for material added type F. Characteristics of Consol N10 MB can be seen in table 1.
Consol N10 MB is particularly suitable for concrete use in precast element construction which requires good workability with high initial and high strength, applicable to:

1) Production of load-bearing pre-cast elements (both on beams and concrete bridge pillars)
2) Structures built by using mold or formwork must be quickly moved or immediately burdened.
3) Casting structural elements

Consol N10 MB provides the following benefits:

1) Workability is very high, with a short implementation time so it can save time and energy
2) Reduced large amounts of water, impermeability and high strength so as to increase durability.
3) High adhesion (cohesion), does not cause segregation despite high workability, so as to improve the quality of the resulting concrete.
4) High initial strength
5) High modulus of elasticity, so the capacity is very high
6) Low shrinkage and shrinkage, resulting in better stability in the resulting dimensions

| Table 1. Consol Characteristics N10 MB |
|--------------------------------------|
| **Data Teknis**                      |
| Basic Chemicals                     | Naphatalene Sulphonated           |
| Form                                | Liquid                           |
| Color                               | Chocolate Old                   |
| Package                             | 200 liter drum                   |
| Specific Weight                     | 1.18 ± 0.01 kg/L (at 25°) – 1.20 kg/ltr |
| Storage age                         | Minimum of 1 year if stored in original unopened packing must be kept at a temperature above 0 on the original drum. When it has frozen, it is melted and can be reused. |
| Dosage                              | The dose depends on mixed planning, ambient conditions, the degree of water reduction and the required workability. The typical dose used is 0.6 – 1.5 % the weight of the cement. It is advisable to experiment to establish the appropriate dose or dosage level as needed. |
| Application                         | It is not recommended to add Consol N10 MB under dry mix conditions. Concrete mixing requires about 75 - 80% of the total mixed water to produce a rigid, moist and homogeneous mixture. Add Consol N10 MB in concrete with a predetermined dose. Mix for at least 3 minutes. Mix for at least 3 minutes. During mixing, add the remaining water until the desired workability is obtained. The use of fly ash or silica fume can be useful in the production of more cohesive concrete. Fly-ash or silica fume can be added with cement. |

Source: [9]
2.4 Compressive Strength

The amount of compressive strength of the concrete can be calculated by dividing the maximum load at the time the test object is destroyed by the cross-sectional area of the specimen. The compressive strength of the concrete can be calculated using the formula [4]:

\[
\text{Compressive strength of concrete} = \frac{P}{A}
\]

Where:
- \( P \) = Axial Style Press (N)
- \( A \) = Cross-sectional area (mm\(^2\))

3. Research Methods

The study was conducted through laboratory testing. The material used is Type I cement (OPC), production of PT. Semen Padang packing 50 kg, coarse aggregate in the form of natural stone originating from the Batu Bersurat area, fine aggregate in the form of crusher processed from Batu Bersurat area, the water used comes from the clean water at Laboratory and the admixture Consol N10 MB production PT. Concrete Technology Indonesia.

Preparation of specimens is made based on the calculation of mixed proportions of mixed concrete designs. Concrete design using the method of DoE (Department of Environment) and Indonesian National Standard (SNI 03-2493-1991) with cylinder molds of 150 mm x 300 mm. The compressive strength of the plan is K 300. Preparation of test specimens was carried out to determine compressive strength at 28 days concrete age, for consumption percentage Consol N 100 MB varies with cement weight. The design of test specimens can be seen in table 2.

| Admixture   | % Added | Total | Sample |
|-------------|---------|-------|--------|
| Consol N10 MB | 0       | 3     | 3      | 3      | 3      | 3      | 3      | 3      | 24     |

Source: Yanti, G., et al. (2018)

4. Result and discussion

The test result on the specimen shows that it happened to the value of the compressive strength of concrete with addition of percentage variation of Consol N10 MB of 0%, 0.1%, 0.3%, 0.5%, 0.8%, 1.0%, 1.2 % dan 1.5% to the weight of cement. The concrete press test results on the specimen can be seen in Table 2.
| % added Consol N10 MB | Object Test | compressive strength (Kg/cm$^2$) | Average (Kg/cm$^2$) |
|------------------------|------------|----------------------------------|---------------------|
| 0%                     | 1          | 309.25                           | 311.56              |
|                        | 2          | 305.77                           |                     |
|                        | 3          | 319.67                           |                     |
| 0.1%                   | 1          | 347.47                           | 346.31              |
|                        | 2          | 337.05                           |                     |
|                        | 3          | 354.42                           |                     |
| 0.3%                   | 1          | 361.37                           | 355.58              |
|                        | 2          | 347.47                           |                     |
|                        | 3          | 357.89                           |                     |
| 0.5%                   | 1          | 371.79                           | 369.48              |
|                        | 2          | 361.37                           |                     |
|                        | 3          | 375.27                           |                     |
| 0.8%                   | 1          | 326.62                           | 330.10              |
|                        | 2          | 330.10                           |                     |
|                        | 3          | 333.57                           |                     |
| 1.0%                   | 1          | 326.62                           | 323.15              |
|                        | 2          | 319.67                           |                     |
|                        | 3          | 323.15                           |                     |
| 1.2%                   | 1          | 284.93                           | 283.77              |
|                        | 2          | 291.87                           |                     |
|                        | 3          | 274.50                           |                     |
| 1.5%                   | 1          | 236.28                           | 245.55              |
|                        | 2          | 250.18                           |                     |
|                        | 3          | 250.18                           |                     |

Source: Yanti, G., et al. (2018)

The relationship of variation in the addition of console N10 MB can be seen in figure 1. On the specimen with the addition of Consol N10 MB obtained an increase in compressive strength of concrete on average up to 0.5 %, with the highest average concrete compressive strength value of 369.48 kg / cm$^2$. But then decreased the compressive strength of concrete along with the addition of Consol N10MB percentage, with the equation obtained that is $y = -113.5 x^2 + 109.8 x + 327.1$
5. Conclusion

The conclusion of the results of the addition of Consol N 10MB to the compressive strength of concrete is:

1) The compressive strength of concrete in the specimen is greater than the compressive strength of the plan which is 300 kg/cm² in the variation of the addition of Consol N10 MB of 0%, 0.3%, 0.5%, 0.8%, and 1.0%

2) The highest compressive strength value is obtained at the addition of 0.5% N10 MB consol of 369.48 kg/cm²

6. References

[1] Antoni dan Paul Nugraha. 2007. Teknologi Beton. Andi Offset:Yogyakarta
[2] Asroni, A. 2010. Balok dan Plat Beton Bertulang Kinerja Tinggi. Yogyakarta : PT. Graha Ilmu
[3] Balai Penelitian dan Pengembangan Pekerjaan Umum. 1993. Tata Cara Pembuatan Rencana Campuran Beton Normal SNI-03-2834-1993. Bandung : Balitbang PU
[4] Badan Standarisisasi Nasional. 2011. Cara Uji Kuat Tekan Beton dengan Benda Uji Silinder SNI 1974:2011. Jakarta : BSN
[5] Badan Standarisisasi Nasional. 2013. Persyaratan Beton Struktural Bangunan Gedung SNI 2847:2013. Jakarta : BSN
[6] Megasari, S.W. & Winayati, 2017. Analisis Pengaruh Penambahan Sikament-NN terhadap Karakteristik Beton. SIKLUS: Jurnal Teknik Sipil, 3(2), hal.117–128.
[7] Sabrina, N.A., Wibowo & Supardi, 2017. Parameter Beton Memadat Mandiri Dengan Kuat Tekan Beton Mutu. , hal.1341–1348.
[8] Seti, A. & Nadia, 2012. Analisis Pengaruh Beton dengan Bahan Admixture Naphtalene dan Polycarboxilate Terhadap Kuat Tekan Beton Normal. Konstruksia, 3(2), hal.33 – 40.
[9] PT. Concrete Technology Indonesia. 2017. Technical Data Sheet. Sidoarjo
[10] Yanti, G., Zainuri, Z. & Megasari, S.W., 2018. Analisa Perbandingan Penambahan Variasi Consol Terhadap Kuat Tekan Beton. SIKLUS: Jurnal Teknik Sipil, 4(1), hal.59–66