Review Article
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True first formula of the uniform regime

Summary

The main objective of this technical article is to redesign the first form of the uniform regimen, which during the revision and search in the International and Internet bibliography, respectively, confirms that the first formula for the evaluation of this regime is engineer Francés Antóine de Chézy in 1769, considered as a paradigm of canal hydraulics. In 1789, the Irish engineer Robert Manning presented his formula, which is currently the most widely used in the regime of this regime.

The author of this technical article, to carry out an analysis of the definition of uniform regimen, considers that in addition to being similar formulas, does not represent in general terms the real conditions, because they are conceptually unique and exclusively for the fluent turbulence it is for the quadrature resistance zone (complete turbulence zone in the Moody chart), given the coefficients of Chézy (CCH) and Manning (nM), independent of the Reynolds number.

It is known that the turbulent fluid is divided into three categories according to the number of Reynolds (Re) and relative rugosity (Kr), its son, full turbulent fluid, (CCH and nM), depends solely on the relative rugosity (Kr), turbulent transient fluid, (CCH and nM), its function of (Re and Kr), and the turbulent fluid is only dependent on the number of Reynolds (Re).

It is concluded that the first formulation of the uniform regimen is the general formula of fluid resistance and also constitutes the origin of the Chezy formula.

Keywords: fluid resistance. Uniform regimen

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Introduction

As a precedent to mention, this is what the first form of the uniform regime proposes. Es decir de la ley general de la resistenscia fluidi, (1765). It is the fundamental equation of hydrodynamics, (Bernoulli, 1738), which constitutes the origin of the mist. It is necessary to clarify that the general formula of fluid resistance is the foundation of the equations. Chezy, (1769), Manning, (1789), Darcy-Weisbach, (1857), Fanning, (1877), etc. This work proposes to revise the first formula for the evaluation of the uniform regimen, (general formula of fluid resistance), which is general, because it is applicable to the three possible categories of turbulent fluids, which all have all the factors which influences in the development of this phenomenon, because it results in more correct and precise results, which by the formulas applied in the current with the same fin, the ones that ignore the influence of the Reynolds number, for which its particular cases, conceptually valid for the category of turbulent turbulent fluid, which corresponds to the complete turbulence zone in the Moody chart.

In the formulas of Chézy, Manning and his followers, they ignore, the influence of Reynolds' number in their respective coefficients, is ubiquitous in the quadratic resistance zone, but these are solely its relative rugosity function. The authors to define these coefficients, what hacen is to determine the parameter of the speed load, altering the principle of Bernoulli. The consequences for not considering Reynolds' number in determining its coefficients. Primarily it is a conceptual error, due to all, the more and less experimental knowledge and studies of the subject coincided with numerous books, that the coefficients of Chézy and Manning, CCH and nM, respectively depend on the number of Re and the relative rugosity, pero no lo incluyen en las formulas. And secondly, the obtained results do not represent the real conditions of the phenomenon, for which it is less accurate and precise.

Demonstrate that the Ley General of Fluid Resistance, is the real formula and correct of the uniform regime. In the article 0229NS "General formulas for the coefficients of Chézy and Manning", it is demonstrated that it, has its origin, in the fundamental equation of hydrodynamics, (Bernoulli), which is the foundation, of the formulas of Chézy, Manning and Darcy-Weisbach, Fanning, for the determination of cargo losses, in their conduct and with precision.

From the previous year, it was reported that the general fluid resistance formula is employed in the uniform regimen, and it is not necessary to know the turbulent flu category that is uncommon, because it is general, as are many of Chézy's coefficients and Manning, who only responds to a particular case of this phenomenon, is not absolutely necessary. The author's criterion, which is the formulas of Chézy and Manning, as well as the infinity of its sequelae, when circulating in the category of turbulent turbulent fluid, in the definition of its coefficients, limit the scope of the general formula of resistance fluida.

Methodology

The study is based on the deduction of the general fluid resistance formulation based on the fundamental equation of hydrodynamics, (Bernoulli), and also the concept of uniform regimen.

$$P_1A - P_2A - \gamma ALSen \quad \alpha = \tau_0 PL$$

$$\div \gamma A$$

$$\frac{P_1A}{\gamma A} - \frac{P_2A}{\gamma A} - \frac{\gamma ALSen\alpha}{\gamma A} = \frac{\tau_0 PL}{\gamma A}$$

$$\frac{P_1}{\gamma}-\frac{P_2}{\gamma}-LSen\alpha=\frac{\tau_0 PL}{\gamma A}$$

$$Sen\alpha=\left(\frac{h_2-h_1}{L}\right)$$

$$\left[\left(\frac{P_1}{\gamma}-\frac{P_2}{\gamma}\right)-\left(h_2-h_1\right)\right]=hf$$

$$hf=\frac{\tau_0 * P * L}{\gamma * A}$$

$$\tau_0=C_R * \rho * \frac{V^2}{2}$$

$$\frac{P}{A}=\frac{1}{R}\quad \frac{\rho}{\gamma}=\frac{1}{g}$$

$$hf=C_R * \frac{L}{R} * \frac{V^2}{2g}$$

That is the general law of fluid resistance.

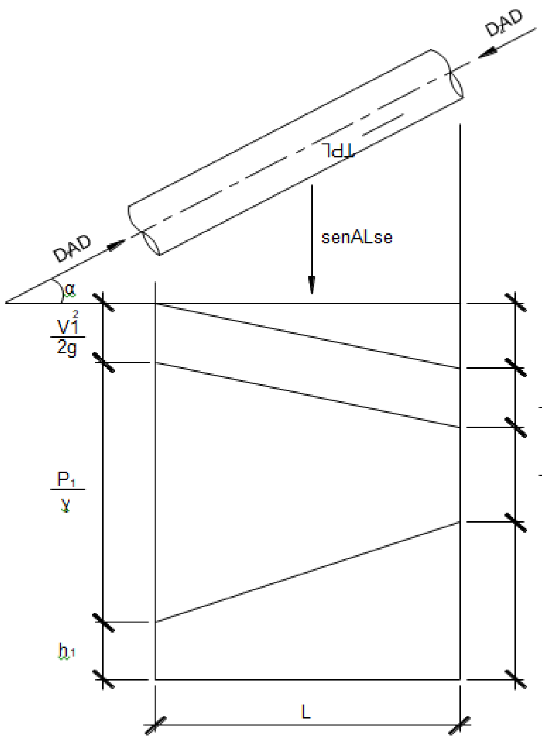

Figure 1 Deduction of the general resistance for fluida.

In order for the uniform regime to be established, the force that produces it is equal to the force that opposes, (force of gravity equal to the force of reduction).

The effort can be expressed in any section of the cape limited as:

$$1.\ \tau_0=C_R * \rho * \frac{V^2}{2}$$

And I know that:

$$2.\ \tau_0=\gamma * R_h * S$$

Match 1 with 2 and draw.

$$S=C_R * \frac{1}{R_h} * \frac{V^2}{2g}$$

Y como

$$S=\frac{hf}{L}\Rightarrow hf=S * L$$

$$hf=C_R * \frac{L}{R_h} * \frac{V^2}{2g}$$

That is the general law of fluid resistance.

$$C_R=\frac{0.0625}{\left[\log\left(\frac{K_s}{14.8 * R_h}+\frac{5.74}{\mathrm{Re}^{0.9}}\right)\right]^2}$$

$$R_h=\frac{A}{P}\quad V=\frac{Q}{A}\quad \mathrm{Re}=\frac{4 * V * R_h}{\nu}$$

$$\nu=\frac{4,97 * 10^{-4}}{\left(T^0C+42,5\right)^{1,5}}$$

$\nu=1 * 10^{-6} m^2/s$; For water to 200C.

The coefficient of resistance to fluid (CR) is the foundation of the coefficients of Chézy, (CH), Manning (nM), Darcy-Weisbach (fD-W) and Fanning, (4CR).

$$C_{CH}=\sqrt{\frac{2g}{C_R}}\quad n_M=\sqrt{\frac{C_R}{2g}} * R_h^{\frac{1}{6}}\quad f_{D-W}=4C_R$$

Según, los Dres. Englesson, Pérez Franco, and Félix Dilla, the coefficient of fluid resistance (CR), is the function of the number of Reynolds (Re) and relative rugosity (Kr). It is possible that the coefficient of Chézy originates in the coefficient of fluid resistance without considering the Reynolds number. It can be appreciated that the general formulas of fluid resistance, Chézy, Manning, Darcy-Weisbach and Fanning, are one of the same.

$$hf=C_R * \frac{L}{R_h} * \frac{V^2}{2g}=\frac{1}{C_{H^2}} * \frac{L}{R_h} * V^2=n_M{}^2 * \frac{L}{R_h^{\frac{4}{3}}} * V^2=f_{D-W} * \frac{L}{D_i} * \frac{V^2}{2g}=4C_R * \frac{L}{Di} * \frac{V^2}{2g}$$

Observe that in the formulas of Chézy and Manning there is no velocity load parameter like tal, it is because of the descompusieron to define its coefficients.

Until the day of the high, the uniform regimen is carried out using the formulas proposed by Chézy and Manning, consider the first and most used respectively, but an analysis of the origin of the work, living with the conclusion that its particular cases, and that the coefficients (CcH and nM), conceptually are evaluated for the condition of their dependence on relative rugosity, ignoring the influence of the Reynolds number. Indeed, the coefficients of Chézy and Manning need to be evaluated as a function of the resistance zone and the accuracy of the Reynolds number and relative rugosity relative to each particular case.[1-10]

Results and discussion

For Excel calculations, using the Colebrook-White formula (CCH, Chézy), the Hec-Ras formula (nM, Manning) and the general fluid resistance formulation, (CCH of Chézy and nM de Manning), to compare we will demonstrate the veracity of the antes exhibited in respect.

A. Canales.

Example. I

Rectangular canal. Burnt cement cemented.

Datos, b = 0.4m, Ks = 0.00025m, S = 0.00215, m = 0.0

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

1. Para Q = 0.0005m^3/s. Colebrook-White. Re = 4 815. CCH = 45.924, QCH = 0.000565 m^3/s.

Results for implementing the general formula of fluid resistance.

1. For Q = 0.0005 m^3/s. Oscar. JM Re = 4 815, CR = 0.01186, CCH = 40.675, QO = 0.000500 m^3/s. The relative error between the CCH coefficients, of the general fluid and Chézy resistance formulas is -12.90%, (unacceptable).

Example. II

Rectangular canal. Burnt cement cemented.

Datos, b = 0.4m, Ks = 0.000025m, S = 0.00215, m = 0.0

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulted in filling in the formula Chézy.

2. For Q = 0.0005 m^3/s. Colebrook-White. Re = 4 826 CCH = 63.449, QCH = 0.000711 m^3/s.

Results for implementing the general formula of fluid resistance.

2. Para Q = 0.0005 m^3/s. Oscar. JM Re = 4 826, CR = 0.00984, CCH = 44.649, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and Chézy resistance formulas is -42.11%, (unacceptable).

Example. III

Rectangular canal. Burnt cement cemented.

Datos, b = 0.4m, Ks = 0.000025m, S = 0.000215, m = 0.0

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

3- Para Q = 0.0005 m^3/s. Colebrook-White. Re = 4 635, CCH = 69, 227 QCH = 0.000774 m^3/s.

Results for the general fluid resistance formula.

3-Para Q = 0.0005 m^3/s. Oscar. JM Re = 4 635, CR = 0.00982, CCH = 44.709, QO = 0.000500 m^3/s.

The relative error between the CCH coefficients, of the general fluid and Chézy resistance formulas is -54.84%, (unacceptable).

Example. IV

Rectangular canal. Burnt cement cemented.

Datos, b = 0.4m, Ks = 0.00025m, S = 0.000215, m = 0.0

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

4- Para Q = 0.0005 m^3/s. Colebrook-White. Re = 4 622, CCH = 51,487, QCH = 0.000606 m^3/s.

Results for the general fluid resistance formula.

4-Para Q = 0.0005 m^3/s. Oscar. JM Re = 4 622, CR = 0.01088, CCH = 42.475, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and Chézy resistance formulas is -21.22%, (unacceptable).

Example. V

Canal rectangular Liso, (Kr = 0.000001). Template of Moody's chart (tube tubes

Resulting in employing the Chézy formula.

5. Para Q = 0.0005 m^3/s. Colebrook-White. Re = 4 827, CCH = 88,539, QCH = 0.000978 m^3/s.

Results for the general fluid resistance formula.

5. Para Q = 0.0005 m^3/s. Oscar. JM Re = 4 827, CR = 0.00957, CCH = 45.267, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and Chézy resistance formulas is -95.59%, (unacceptable).

Eample. VI

Canal rectangular Liso, (Kr = 0.000001). Tomado del diagrama de Moody, (tubos lisos).

Resultado em emplear las formula Chezy.

6. Para Q = 0.005 m^3/s. Colebrook-White. Re = 43 802, CCH = 98,523, QCH = 0.008141 m^3/s.

Results for the general fluid resistance formula.

6. Para Q = 0.005 m^3/s. Oscar. JM Re = 43 802, CR = 0.00536, CCH = 60.512, QO = 0.0050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and Cheese resistance formulas is -62.81%, (unacceptable) (Table 1).

B. Tuberías, (parcialmente llenas).

Eample. I

Tuberia. Stubborn cement residue.

Datos, Di = 0.130m, h / Di = 0.14340, Ks = 0.00025m, S = 0.00215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

1. Para Q = 0.0005 m^3/s. Colebrook-White. Re = 19 807, CCH = 57,476, QCH = 0.000562 m^3/s.

Results for implementing the general formula of fluid resistance.

1. For Q = 0.0005 m^3/s. Oscar. JM Re = 19 807, CR = 0.00890 CCH = 51.139, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and chemical resistance formulas is -12.39 (unacceptable).

Example II

Tuberia. Stubborn cement residue.

Datos, Di = 0.160m, h / Di = 0.09604, Ks = 0.000025m, S = 0.00215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

2. For Q = 0.0005 m^3/s. Colebrook-White. Re = 19 836, CCH = 77,099, QCH = 0.000705 m^3/s.

Results for implementing the general formula of fluid resistance.

2. For Q = 0.0005 m^3/s. Oscar. JM Re = 19 836, CR = 0.00684, CCH = 54.674, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and Chézy resistance formulas is -41.02, (unacceptable).

Example III

Tuberia. Stubborn cement residue.

Datos, Di = 0.0800m, h / Di = 0.92450, Ks = 0.000025m, S = 0.000215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

3. For Q = 0.0005 m^3/s. Colebrook-White. Re = 9 672, CCH = 71,681, QCH = 0.000721 m^3/s.

Results for implementing the general formula of fluid resistance.

3. For Q = 0.0005 m^3/s. Oscar. JM Re = 9 672, CR = 0.00792, CCH = 49.681, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and chemical resistance formulas is -44.28, (unacceptable).

Example IV

Tuberia. Stubborn cement residue.

Datos, Di = 0.08630m, h / Di = 0.78230, Ks = 0.00025m, S = 0.000215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

4. For Q = 0.0005 m^3/s. Colebrook-White. Re = 10 676, CCH = 54.273, QCH = 0.000574 m^3/s.

Results for implementing the general formula of fluid resistance.

4. For Q = 0.0005 m^3/s. Oscar. JM Re = 10 676, CR = 0.00859, CCH = 47291, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and Chézy resistance formulas is -14.76, (unacceptable).

Example V

Tuberia. Lisa. (Kr = 0.000001). Tomado del diagrama de Moody, (tubos lisos).

Datos, Di = 0.049220m, h / Di = 0.7917, Ks = 6.0 * 18 ^ -8m, S = 0.000215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

5. For Q = 0.0005 m^3/s. Colebrook-White. Re = 18 523, CCH = 93.047, QCH = 0.000853 m^3/s.

Results for implementing the general formula of fluid resistance.

5. For Q = 0.0005 m^3/s. Oscar. JM Re = 18 523, CR = 0.00659, CCH = 54.565, QO = 0.000500 m^3/s.

The relative error between the CCH coefficients, of the general fluid and chemical resistance formulas is -70.52, (unacceptable).

Example. VI

Tuberia. Lisa, (Kr = 0.000001). Tomado del diagrama de Moody, (tubos lisos).

Datos, Di = 0.1200m, h / Di = 0.72970, Ks = 6.3 * 10 = 8, S = 0.00215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

6. Para Q = 0.005 m^3/s. Colebrook-White. Re = 81 829, CCH = 100.013, QCH = 0.00500 m^3/s.

Results for implementing the general formula of fluid resistance.

1. Para Q = 0.005 m^3/s. Oscar. JM Re = 81 825, CR = 0.004867, CCH = 64.829, QO = 0.0050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and chemical resistance formulas is -54.28, (unacceptable) (Table 2).

C. Tuberías, (llenas).

Example I

Tuberia. Stubborn cement residue.

Datos, Di = 0.05129m, h / Di = 1, Ks = 0.00025m, S = 0.00215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

1. Para Q = 0.0005 m^3/s. Colebrook-White. Re = 12,412, CCH = 50,206, QCH = 0.000545 m^3/s.

Results for implementing the general formula of fluid resistance.

1. For Q = 0.0005 m^3/s. Oscar. JM Re = 12 412, CR = 0.00924 CCH = 46.089, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and chemical resistance formulas is -8.93, (unacceptable).

Example. II

Tuberia. Stubborn cement residue.

Datos, Di = 0.049155m, h / Di = 1, Ks = 0.000025m, S = 0.00215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

2. For Q = 0.0005 m^3/s. Colebrook-White. Re = 12 951, CCH = 67. 873, QCH = 0.000662 m^3/s.

Results for implementing the general formula of fluid resistance.

2. For Q = 0.0005 m^3/s. Oscar. JM Re = 12 951, CR = 0.00747, CCH = 51.254, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and chemical resistance formulas is -32.42, (unacceptable).

Example. III

Tuberia. Stubborn cement residue.

Datos, Di = 0.07970m, h / Di = 1, Ks = 0.000025m, S = 0.000215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

3. For Q = 0.0005 m^3/s. Colebrook-White. Re = 7 988, CCH = 71,652, QCH = 0.000740 m^3/s.

Results for implementing the general formula of fluid resistance.

3. For Q = 0.0005 m^3/s. Oscar. JM Re = 7 988, CR = 0.00837, CCH = 48.421, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and Chézy resistance formulas is -47.98, (unacceptable).

Example IV

Tuberia. Stubborn cement residue.

Datos, Di = 0.08155m, h / Di = 1, Ks = 0.00025m, S = 0.000215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

4. For Q = 0.0005 m^3/s. Colebrook-White. Re = 7 806, CCH = 53.831, QCH = 0.000589 m^3/s.

Results for implementing the general formula of fluid resistance.

4. For Q = 0.0005 m^3/s. Oscar. JM Re = 7806, CR = 0.00939, CCH = 45.712, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and chemical resistance formulas is -17.76, (unacceptable).

Example V

Tuberia. Lisa, (Kr = 0.000001). Tomado del diagrama de Moody, (tubos lisos).

Datos, Di = 0.04820m, h / Di = 1, Ks = 5.0 * 18 ^ -8m, S = 0.00215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

5. For Q = 0.0005 m^3/s. Colebrook-White. Re = 13 040, CCH = 92.983, QCH = 0.000892 m^3/s.

Results for implementing the general formula of fluid resistance.

5. For Q = 0.0005 m^3/s. Oscar. JM Re = 13 040, CR = 0.00722, CCH = 52.135, QO = 0.00050 m^3/s.

The relative error between the CCH coefficients, of the general fluid and chemical resistance formulas is -78.34, (unacceptable).

Example VI

Tuberia. Lisa, (Kr = 0.000001). Tomado del diagrama de Moody, (tubos lisos).

Datos, Di = 0.11430m, h / Di = 1, Ks = 1.14 * 10 ^ = 7m, S = 0.00215

If tomó. ν = 1 * 10--6 m^2/s, (Cinematic viscosity for water at 20 0C).

Resulting in employing the Chézy formula.

6. Para Q = 0.005 m^3/s. Colebrook-White. Re = 55 697, CCH = 99.633, QCH = 0.008013 m^3/s.

Results for implementing the general formula of fluid resistance.

6. For Q = 0.0005 m^3/s. Oscar. JM Re = 55 697, CR = 0.00508, CCH = 62.172, QO = 0.0050 m^3/s.

The relative error between the CCH coefficients, of the general fluid resistance formulas and CCH Chézy is -60.25, (unacceptable) (Table 3).

Here we calculate the relative error for the Chézy coefficients evaluated by the Colebrook-White formulas, (actual), and the general formula of fluid resistance, (proposition), respectively. However, it is possible to determine the coefficients of hydraulic resistance, speed and speed for the gas. Practically similar results are obtained for the different examples. (All calculations are done in Excel, while the normal depth has to be recorded at the design level).

When the relative error is greater than 5%, it is considered unacceptable.

It is observed that conductivity with rugosity y / o depends relatively low, to fill the form of Colebrook-White, CCH crece desmedidamente.

Introduce that for hydraulic transitional surfaces and/or lists, the current formulas do not consider the influence of the Reynolds number, nor are they conceptually valid, because for these cases the coefficients are the function of the Reynolds vs number. Relative rugosity and Reynolds number respectively. Observe the same tendency of error relative to channels and tubercles, in addition to the examples V and VI, (conductive readings), in both cases the coefficient of Chézy is mayor of 100, by which the friction factor of Darcy-Weisbach is less than 0.008, which did not make sense when you look at the Moody chart.

In Excel we have prepared tables, with different types of sections, (circular, trapezoidal, rectangular and triangular), and infinity of combinations of hydraulic and geometric data of the measures and the results, confirms the superiority of the general formula of the fluid resistance, in terms of veracity and precision with respect to Chézy's formula. The general formula of fluid resistance is a lie, because it considers all the possible manifestations of the phenomenon, (has in mind the relationship between the parameters that participate in it). If not Chézy's formula, because it's a particular case, (do not consider the influence of Reynolds' number).

Thus, the general formula of fluid resistance is chronologically anterior and conceptually superior to the formula of Chézy, (1765, general vs. 1769, Particular, respectively).

Sotelo. Full. 2, p. 121.

Ex. 2.5.- A rectangular canal has 2 m, of anchorage and is cement cement in surface lisa, (n = 0. 011). Calcular: a) The guest Q that conducts when the normal tyrant is from 1.50 my the pendiente of 0.000126; b) The normal tyrant when Q = 4 m^3/sy S = 0.008; c) The normal pendulum when y = 1.0 y Q = 3 m^3/s.

a) Pregunta. The guest Q that conducts when the normal tyrant is 1.50 my the pendiente of S = 0.000126?

a) Response: Sotelo. Q = 2,178 m^3/s.

a) Oscar: For Q = 2.178 m^3 / sy nM = 0.0110. The absolute rugosity should be Ks = 0.00005 my not the ones that appear in this reference. Además does not apply the Reynolds number, as it should be calculated by, $Re = \frac{4 * V * R_h}{\nu}$ Y no por, $Re = \frac{V * R_h}{\nu}$

a.1) Sotelo. Full. 2, p. 79. Table 2.2. Ks = 0.45 mm, (0.00045m). Cement liso, (carefully finished).

Q = 1,932 m^3 / sy nM = 0.01240

a.2) Sotelo. Full. 2, p. 88. Colebrook-White; For so. $n = 0.0385 Ks^{\frac{1}{6}}$

$$Ks = (\frac{n}{0.0385})^6$$

$$Ks = \left(\frac{0.011}{0.0385}\right)^6 = 0.537275mm \approx 0.00054m .$$

Q = 1,900 m3 / sy nM = 0.01261

a.3) Sotelo. Full. 2, p. 88. Strickler: $n = 0.0122 Ks^{\frac{1}{6}}$ For so. $Ks = (\frac{n}{0.0122})^6$

$$Ks = \left(\frac{0.011}{0.0122}\right)^6 = 0.537275mm \approx 0.00054m$$

Q = 1,900 m3 / syy nM = 0.01262

a.4) Sotelo. Full. 2, p. 88. Williamson: $n = 0.0119 Ks^{\frac{1}{6}}$ For so. $Ks = (\frac{n}{0.0119})^6$

$$Ks = \left(\frac{0.011}{0.0119}\right)^6 = 0.6238m \approx 0.000624mm$$

Q = 1.885 m^3 / sy nM = 0.01271

a.5) Sotelo. Full. 2, p. 88. Williamson: $n = 0.0400 Ks^{\frac{1}{6}}$; For so. $Ks = (\frac{n}{0.0400})^6$

$$Ks = \left(\frac{0.011}{0.0040}\right)^6 = 0.400m \approx 0.0004mm$$

Q = 1,950 m^3 / sy nM = 0.01229

The coefficient of Manning is (nM = 0.012526). For the 5 propositions of Ks, of this reference, the same as the demas ignoring the influence of the Reynolds number, because it should not be corrected. The previous results were obtained for: b = 2m, y = 1.5my S-0.000126, because of his medibles, in exchangethe coefficient of Manning, (nM) is very unstable, (impreciso).

a.6) Author. See, article. ID (0229NS), "General formulas for the Chezy and Manning coefficients".

$$n_M = \sqrt{\frac{C_R}{2g}} * R_h^{\frac{1}{6}} = \frac{1}{C_{CH}} * R_h^{\frac{1}{6}}$$

$$n_M = \frac{5.644 * 10^{-2}}{\log\left(\frac{K_s}{14.8 * R_h} + \frac{5.74}{\mathrm{Re}^{0.9}}\right)} * R_h^{\frac{1}{6}}$$

b) Pregunta. The normal tyrant when Q = 4 m^3 / sy S = 0.008?, (b = 2.0 my nM = 0.011).

b) Response: Sotelo. y = 0.508m3 / s, for which the normal tyrant value is in = 0.0011, the ruggedness must be, Ks = 0.000236 m;

Según: $n_M = \frac{Ks^{\frac{1}{6}}}{25.6} \Rightarrow Ks \approx 0.0005m$

b) Response: Oscar. y = 0.465328m, in this case, n = 0.009686.

The previous result was obtained for: b = 2m, Q = 4m^3 / s, S = 0.008 and Ks = 0.0005 m.

Consult: Hydraulics of Sotelo Canals. Full. 2, Page. 89.

c) Pregunta. The normal pendulum when y = 1.0 m, Q = 3 m3 / s, b-2.0 m, n = 0.011?

c) Response: Sotelo. S = 0.000686. Observar, aqui dan todos los datos, solo es despExar la pendiente, (rasante) y calcular.

$$Q = \frac{1}{n_M} * R_h^{\frac{2}{3}} * S^{\frac{1}{2}} * A \Rightarrow S = \frac{{n_M}^2 * Q^2}{R_h^{\frac{4}{3}}} = 0.000686$$

Compare with: Según. Rouse, (1883), Powell, (1950), Chow, (1959), Kinori, (1970), y Raju, (1980). For surface cementation carefully finished, (Ks = 0.00045 mm).

c) Response: Oscar. S = 0.000829.

For those who subscribe to this ultimate value of the pendiente, (S), represent with greater certainty and precision the real conditions, because absolute rugosity, (Ks), can be measured with much more accuracy, (laser ray method), which the coefficient of Manning, (nM: particular formulas y / o empirics, tables, graphics, photos).

In the Hydraulic Canal reference. Sotelo. Full. 2. Pág. Ex. 2.5. To respond to the inconsistencies of the incisions, a), b), yc). Solo hay que sustituir y calcular, pues se dan todos los datos.

También se calcularon en Excel los Ex. 2.6, 2.7, 2.9, and 2.10. Ídem al Ex. 2.5. Now, it is necessary to clarify that in these are selected the value of the Manning coefficient, from the tables, 2.6a, 2.6b, 2.6c, pages, 95, 96, and 97, respectively, of this reference. For those who subscribe, it is technically better to calculate, (nM), with the goal of obtaining the best results.

Sotelo. In his book. Hydraulics of Canals. Full. 2. Expone.

i. Page. 89. Sotelo. Enumerates 8 limitations observed in the application of the Manning equation. The ones that are more than enough to get the results obtained for this job.
ii. Page. 89. Sotelo. From the solution of. Ex. 2.1, read the conclusion. It is very important to select the adequate value of n. Everything that the final result is very sensitive to dicho value.
iii. Page. 93. Sotelo. Express. The application of the Manning equation is restricted to turbulent fluid in rugged canals.

Interestingly enough, it's infinity of investigators's vast experiences and acquaintances with respect that the Chézy and Manning coefficients depend on the relative rugosity and number of Reynolds, but all in its forms ignore the influence of this last, real only sole dependence on rugosity.

For the antecedent for the author of this article, the Ex. Here we present more of the uniform regime that appeared in this reference many days ago. Because it does not include the Reynolds number in the calculations and it is not calculated by the idon formula.

To emulate the equations of Chezy and Manning, it means that the category of fluid is alloy of turbulent turbulent fluid, (quadrature resistance zone, complete turbulence zone in Moody's diagram), in which the coefficients have only their function of relative rugosity, also of Reynolds number, results to apply the referenced formulas, to which the geometry of the section, are sub-dimensioned. Because the coefficients, (CCH and nM), are calculated. It can be easily determined by climbing any curve, by debiting the trajectory line in the Moody chart and changing the Reynolds number, or more precisely one, to determine the CCH and nM coefficients, according to the Colebrook-White y formulas Hec-Ras, respectively or any other of the traditional, (Kutter, Bazin, Pavlovski, More examples. These confirm the validity of the property in this article, in addition the author hopes that, if there are some dudas, we exemplify the eliminations (Table 4).

Observar: While the number of Reynolds increases the relative error between the Chezy formulas and the general resistance of fluid resistance it decreases until practically the minimum, because the turbulent fluid is present in the turbulent fluid, (plenum). Quadratic resistance zone or complete turbulence in the Moody chart, where the coefficients are independent of the Reynolds number, are to be determined solely depending on relative rugosity. It can be seen that the coefficient of Chezy, (CCH), calculated by the Colebrook-White formula, its value is always that of the formula. From what appears to be the channels designed by Chezy van's formula will be oversized. (It is his ability to lead the mayor to do what he was designed to do) (Table 5).

Table 1

Canal rectangular								
Comparac	**Qd, (m³/s)**	**Ks, (m³/s)**	**Kr, (adim)**	**Re, (adim)**	**CHChézy**	**Su, (adim)**	**Er, CH 2 (%)**	**N0**
Actual	0.0005	0.00025	0.008243	4 815	45,924	0.002150		1.1 ≠ Moody
Propuest	0.0005	0.00025	0.008243	4 815	40,675	0.002150	-12.90	1.1 = Moody
Actual	0.0005	0.000025	0.000896	4 826	63,449	0.002150		1.2 ≠ Moody
Propuest	0.0005	0.000025	0.000896	4 826	44,649	0.002150	-42.11	1.2 = Moody
Actual	0.0005	0.000025	0.000428	4 635	69,227	0.000215		1.3 ≠ Moody
Propuest	0.0005	0.000025	0.000428	4 635	44,709	0.000215	-54.84	1.3 = Moody
Actual	0.0005	0.00025	0.000414	4 622	51,487	0.000215		1.4 ≠ Moody
Propuest	0.0005	0.00025	0.000414	4 622	42,475	0.000215	-21.22	1.4 = Moody
			LISO					Liso
Actual	0.0005	2.8E-08	0.000001	4 827	88,539	0.00215		1.5 ≠ Moody
Propuest	0.0005	2.8E-08	0.000001	4 827	45,267	0.00215	-95.59	1.5 = Moody
Actual	0.005	9.9E-09	0.000001	43 802	98,523	0.00215		1.6 ≠ Moody
Propuest	0.005	9.9E-09	0.000001	43 802	60,512	0.00215	-62.82	1.6 = Moody

Table 2

Tuberia Parcialmente Llena								
Comparac	**Qd, (m³/s)**	**Ks, (m³/s)**	**Kr, (adim)**	**Re, (adim)**	**CHChézy**	**Su, (adim)**	**Er, CH 2 (%)**	**N0**
Actual	0.0005	0.00025	0.004874	12 412	50,206	0.002150		1.1 ≠ Moody
Propuest	0.0005	0.00025	0.004874	12 412	46,089	0.002150	-8.93	1.1 = Moody
Actual	0.0005	0.000025	0.000639	19 836	77,099	0.002150		1.2 ≠ Moody
Propuest	0.0005	0.000025	0.000639	19 836	54,674	0.002150	-41.02	1.2 = Moody
Actual	0.0005	0.000025	0.000266	9 672	71,681	0.000215		1.3 ≠ Moody
Propuest	0.0005	0.000025	0.000266	9 672	49,681	0.000215	-44.28	1.3 = Moody
Actual	0.0005	0.00025	0.002385	10 676	54,273	0.000215		1.4 ≠ Moody
Propuest	0.0005	0.00025	0.002385	10 676	47,291	0.000215	-14.76	1.4 = Moody
			LISO					Liso
Actual	0.0005	6.0E-08	0.000001	18 523	93,047	0.00215		1.5 ≠ Moody
Propuest	0.0005	6.0E-08	0.000001	18 523	54,565	0.00215	-70.53	1.5 = Moody
Actual	0.005	1.4E-07	0.000001	81 829	100,013	0.00215		1.6 ≠ Moody
Propuest	0.005	1.4E-07	0.000001	81 829	64,829	0.00215	-54.27	1.6 = Moody

Table 3

Tuberia Llena								
Comparac	**Qd, (m3/s)**	**Ks, (m3/s)**	**Kr, (adim)**	**Re, (adim)**	**Cchezy**	**Su, (adim)**	**Er, CH 2 (%)**	**N0**
Actual	0.0005	0.00025	0.005396	19 807	57,476	0.002150		1.1 ≠ Moody
Propuest	0.0005	0.00025	0.005396	19 807	51,139	0.002150	-12.39	1.1 = Moody
Actual	0.0005	0.000025	0.000509	12 951	67,873	0.002150		1.2 ≠ Moody
Propuest	0.0005	0.000025	0.000509	12 951	51,254	0.002150	-32.42	1.2 = Moody
Actual	0.0005	0.000025	0.000266	7 988	71,652	0.000215		1.3 ≠ Moody
Propuest	0.0005	0.000025	0.000266	7 988	48,421	0.000215	-47.98	1.3 = Moody
Actual	0.0005	0.00025	0.003065	7 806	53,831	0.000215		1.4 ≠ Moody
Propuest	0.0005	0.00025	0.003065	7 806	45,712	0.000215	-17.76	1.4 = Moody
			LISO					Liso
Actual	0.0005	5.0E-08	0.000001	13 040	92,983	0.00215		1.5 ≠ Moody
Propuest	0.0005	5.0E-08	0.000001	13 040	52,139	0.00215	-78.34	1.5 = Moody
Actual	0.005	1.1E-07	0.000001	55 697	99,633	0.00215		1.6 ≠ Moody
Propuest	0.005	1.1E-07	0.000001	55 697	64,829	0.00215	-53.69	1.6 = Moody

Table 4

Moody	Qd, (m³/s)	Ks, (adim)	Re, (adim)	CH.CW	CH-OJM	Su, (adim)	Er (%)	Kr, (adim)
1 FTTR	0.0005	0.00025	4 815	45,924	40,675	0.002150	-12.90	0.00843
2 FTTR	0.0010	0.00025	9 453	48,969	44,548	0.002150	-9.92	0.00571
3 FTTR	0.0050	0.00025	43 290	55,980	53,039	0.002150	-5.54	0.00233
4 FTTR	0.0070	0.00025	58 725	57.4080	54,705	0.002150	-4.94	0.00294
5 FTTR	0.0100	0.00025	80 515	58,895	56,420	0.002150	-4.39	0.00160
6 FTTR	0.0150	0.00025	113 838	60,538	58,294	0.002150	-3.71	0.00130
7 FTTR	0.0200	0.00025	144 509	61,658	59. 564	0.002150	-3.51	0.00113
8 FTTR	0.025	0.00025	172 718	62. 503	60. 515	0.002150	-3.29	0.00101
9 FTTR	0.0297	0.00025	197 362	63. 143	61,227	0.002150	-3.13	0.00093
10 FTTR	0.0327	0.00025	212 317	63,490	61,615	0.002150	-3.04	0.00089
11 FTTR	0.0483	0.00025	281 690	64,839	63,112	0.002150	-2.74	0.00075
12 FTTR	0.0511	0.00025	292 887	65,036	63,318	0.002150	-2.56	0.00067
13 FTTR	0.0628	0.00025	336 323	65,686	64,046	0.002150	-2.53	0.00066
14 FTTR	0.0655	0.00025	435 646	65,817	64,190	0.002150	-2.48	0.00061
15 FTTR	0.0722	0.00025	367 776	66,114	64,517	0.002150	-2.37	0.00059
16 FTTR	0.0873	0.00025	413 108	66,670	65,127	0.002150	-2.37	0.00059
17 FTTR	0.0874	0.00025	413 185	66,674	65,131	0.002150	-2.29	0.00056
18 FTTR	0.1024	0.00025	453 097	67,114	65,612	0.002150	-2.27	0.00055
19 FTTR	0.1075	0.00025	465 570	67,244	65,754	0.002150	-2.12	0.0005
20 FTTR	0.15	0.00025	554 017	68,077	66,662	0.002150	-2.02	0.00046
21 FTTR	0.2	0.00025	631 912	68,712	67,351	0.002150	1.90	0.00041
22 FTTR	0.3	0.00025	739 827	69,467	68,169	0.002150	1.84	0.00039
23 FTTR	0.4	0.00025	810b 537	69,911	68,646	0.002150	1.80	0.00038
24 FTTR	0.5	0.00025	862 069	70,202	68,961	0.002150	1.72	0.00035
25 FTTR	0.9	0.00025	1 041 667	70,787	69,590	0.002150	1.68	0.00034
26 FTTR	0.0297	0.000001	204 616	105,715	71,155	0.002150	-48.57	0.0000040
27 FTTR	0.90	0.000001	1 125 000	113,800	82,902	0.002150	-37.26	0.0000014
28 FTTR	1.50	0.000001	1 219 458	114. 181	83,458	0.002150	-36.81	0.0000014

FTTR, Transitional turbulent flow.

Table 5

Moody	Qd, (m³/s)	Ks, (adim)	Kr, (adim)	Re, (adim)	fchezy	property	Su, (adim)	Er (%)
26 FTLISO	0.0297	0.000001	0.0000040	204 616	0.00702	0.01550	0.002150	-120.80
27 FTLISO	0.90	0.000001	0.0000014	1 125 000	0.00606	0.01142	0.002150	-88.45
28FTLISO	1.50	0.000001	0.0000014	1 219 458	0.00602	0.01127	0.002150	-87.21

Observe that in the lines, 26, 27, and 28. Where the fluid is turbulent, for which the hydraulic resistance coefficients are its unique function and exclusively of the Reynolds number. The Chezy formula of the unacceptable values of the coefficient of friction of Darcy-Weisbach, (fD-W). In exchange for the proposal, values that represent the real conditions are obtained. In practice, the majority of hydraulic problems correspond to the turbulent transitional fluid. Decide with the transition zone, where the coefficients depend on the Reynolds number and the relative rugosity. In the book. Hydraulics of Canals. Sotelo. Full. 2. Get rid of the same calculation errors. Because they employ the traditional formulas of Chezy and Manning.

Evidence

Moody's Chart

1. By trace of the trace line, the fluid is turbulent plenum, (zone of complete turbulence or quadratic resistance), giving the coefficient fD-W, only the function of relative rugosity, (Reynolds number does not influence and el).

2. Between the line of traces and the curve for smooth tubes, the fluid is turbulent transitional, (transition zone), where the coefficient fD-W, is the function of relative rugosity and Reynolds number).

3. About the curve for tube tubes, the fluid is turbulent lysode, given the coefficient fD-W, is the function of the Reynolds number, (relative rugosity does not influence it).

4. For the shape of the curves for constant rugosity, observe the influence of the Reynolds number on the fD-W coefficient.

4.1. Rugosidad relativa = 0.0003

Re = 7800, corresponding, fD-W = 0.036 and CCH = 46.690

Re = 3 * 10 ^ 6, the corresponding, fD-W = 0.015 and CCH = 72.332

For relative rugosity of 0.0003, (constant), for Re 3 * 10 ^ 6, the coefficient of Chézy, (CCH), is 1.55 times greater than, for Re = 7800, both are ubiquitous in the transition zone.

It is known that $C_{CH} = \sqrt{\frac{8*g}{f_{D-W}}}$, 8g = 78.48, constant, as for a constant rugosity, to increase the number of Re, the coefficient of friction of Darcy-Weisbach, (fD-W) decreases and is the denominator of a constant to produce an increase of the coefficient of Chézy, (CCH).

"An experimental study in amplia escalates on the variability of the fD-W coefficient, conducted by Nikuradse in tubercles and by Zegshda in Cretaceous rectangular canals to the extent a uniformly distributed rugosity".

"The results obtained by A. Zegshda hold great value for the hydraulics of the open caucasians, bearing in mind that the dates and conclusions of Zegshda demonstrated, not only the qualitative analogy with the graphs of Nikuradse, but also the quantitative coincidence of the calculation equations.

All bibliography consulted express.

The formulas of Chézy and Manning are soles and only applicable to the quadrature resistance zone. Depending on its content, the issues regarding cargo losses need to be analyzed separately for the turbulent flow, subdivided into the last for its three possible categories in the uniform regime.

Hydraulics of open canals; Sturm. Cap. 4. Flujo Uniforme. Page. 120. "When the flow is in the turbulent regime completely aperitif, the Manning equation is appropriated for the normal depth calculation, for the turbulent transition regions and the Chézy equation that must be used.

$$AR^{1/2} = \frac{Qf^{1/2}}{(8gS)^{1/2}} \quad (4.33)$$

As far as the friction factor of Darcy-Weisbach is concerned, it is located in the right of the equation, although it depends on the number of Reynolds and the relative rugosity that is its function of the normal depth of descent. Equation 4.33, can be resolved by the normal depth assuming a value of fD-W an iteration with the Moody chart or Equation 4.18 (the Colebrook-White equation)".

$$\frac{1}{\sqrt{f}} = 2\log\left[\frac{Ks/d}{3.7} + \frac{2.51}{\mathrm{Re}\sqrt{f}}\right]$$

Hydraulics of canals. C. Dr. Alcides. L. Méndez and Armando Estopiñán.

Cap. 5. Epig. 5.3. Uniform regime. Page. 121.

"The CCH coefficient, albeit the fD-W, of Darcy, depends on the rugosity of the guidance and number of Reynolds. It has not been studied extensively since the fD-W ", (recreates the works of Nikuradse, Moody, Colebrook-White, Frénkel, Zegshda), and has not read the results of high reliability".

Prof. Ing. Alcides León. In his book: Hydraulics of Free Conduct. Cap. Page 4 223.

In general, it will be hoped that as much as C depends on the Reynolds Number, the frontal conditions and the channel geometry.

Hydraulics of Free Conduct. Prof. Dr. Alcides. JL Méndez.

Cap. 4. The Uniform Regime. Page. 225.

A group of the ASCE in 1963, concluded that for channels a diagram of resistance f vs. Re of tubercles is adequate to estimate fy así no C.

Cap. 4. The Uniform Regime. Page. 229.

"As demonstrated, Manning's equation, strictly speaking,

Solo is applicable to highly turbulent fluids on rugged fronts. The estimate of value appropriated in these cases is given in an extremely important question".

HIDRÁULICA; TOMO I; II Agroskin. Cap. XIII. Page. 439.

"Previously, it was stated that the coefficient $C = \sqrt{\frac{8g}{f}}$, depending essentially on the resistance zone (tube tubes, transition, cuadratics). For this reason, we will first and foremost specify the indices for the establishment of the resistance zone. "

HIDRÁULICA; TOMO I; II Agroskin. Cap. XIII. Page. 441.

"For the Chezy coefficient C in the quadratic resistance zone we use the CCR symbolology and we keep the symbol C for each other zone and in particular for the transition zone".

HYDRAULIC MANUAL. HW King. SECTION 6. Pág. 168.

"From the previous study, relative to Figure 86, we can conclude that Chézy's formula yields excellent results for the current corrosion in large numbers of Reynolds numbers, in which case the exponent of V is approximately 2. When will other researchers be found does not agree with the experimental results on tubular velocity tubes, there are other empirical formulas to satisfy each particular group of studies. Only in recent years is there a general fashion reconstruction that all the essays on this nature can unify in the middle of the Reynolds number".

Conclusion

1. The first formula for the evaluation of the uniform regime is the general law of fluid resistance.
2. The general fluid resistance formulation is the foundation of the Chézy formulation.

Acknowledgments

None.

Conflicts of Interest

None.

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