

Issue 7, March 2005

[From Oil Rigs to Sawdust](#) | [Did You Know?](#) | [Hot Websites](#) | [Product Spotlight](#) | [Ask the Expert](#) | [Upcoming Events](#)

## Moog Acquires ProControl to Expand Electric Solution Offerings

by Harald Sieffer, Vice President, Moog Inc.



I am pleased to announce that we have recently acquired ProControl AG, the Switzerland based expert on Motion Control Solutions for the plastics industry. This acquisition expands on Moog's capabilities to provide electric system solutions for the machinery industry. Let me share with you some background on this company that has been a longtime partner of Moog.

ProControl is a leading provider of motion control technology for plastics processing machines. In existence since 1991, the company specializes in the design of electric solutions in injection molding, blow molding, and stretch blow molding machine applications. They have proven solutions for supporting companies in the transition to electric technology and development of new generation machines. One of the core benefits they bring to machine builders is a deep knowledge of the applications and recommendations on improving machine architecture to meet the latest customer demands.

ProControl is based in Flawil, Switzerland. The founders have over 50 years of experience in the plastics market and a unique service offering that is recognized in the industry. ProControl's product portfolio includes multi-axis drives, servomotors, and motion control software many of which were co-developed with Moog.

ProControl has demonstrated leadership in the development of new electric technology for plastics machines. They have worked closely with machine builders to innovate and improve machine performance. Some milestones of ProControl history include:

**1992:** First European All-Electric Machine

**1996:** First All Electric Blow Molding Machine in Europe

**2000:** First All Electric Die-Casting Machine

**2002:** All Electric Optical Disk Molding Machine

**1992 - present:** Numerous patents awarded for building and controlling electric axes for plastic machinery.

ProControl is a perfect match with Moog's capabilities and position in the plastic machinery market. The motion control expertise and the strong customer relationships of Moog in the plastics industry offer our customers a competent and reliable partner for solving demanding motion control problems. ProControl is now expanding this leadership position into electric drives solutions. In the future we expect to leverage this knowledge to support companies in other industries as well.

Please join me in welcoming ProControl to the Moog organization.

### *About the Author:*

Harald E. Seiffer is a Vice President of Moog Inc. He started with Moog in 1989 as an Application Engineer, and held several management positions in sales and product management, before assuming the roles of General Manager of Moog GmbH in Germany and Business Development Manager for Moog Europe. He has a Masters degree in Electronics Engineering from the University of Stuttgart.

# From Oil Rigs to Sawdust: Environmentally Safe Products at Work



[Moog Flame-Proof Servovalves](#) | [Moog Explosion-Proof Direct Drive Servovalves](#) | [Conclusion](#) | [Authors](#)

For most machine builders, their greatest technical challenge is achieving ever-higher performance (e.g., faster, less scrap, better quality). A segment of Moog's customers face an even greater challenge, how to achieve performance objectives in extreme environments. This article profiles two examples of machinery controlled by Moog's Servovalve and Servo-Proportional Valves that are used in hazardous environments. The first is an offshore oilrig used in the North Sea in a corrosive environment with violent motion and in the presence of gas. Consider the challenges of designing machinery subject to 29-meter (95 ft.) high waves, operating in the extreme temperatures experienced well north of the Arctic Circle.

The second example is a particleboard press system that is exposed to hazardous dust environments that are potentially explosive. This machine is operating around the clock and it requires both high quantity and quality of output. In each case, Moog developed a unique solution that enabled the customer to meet safety requirements required by law as well as the practical performance requirements of a demanding application.

## Moog Flame-Proof Servovalves Operating in Offshore Drilling Equipment

### Background

Following the discovery of significant oil reserves in the North Sea in the late 1960's, a whole industry has been created around developing and building the machinery to find and extract these reserves. A number of Norwegian companies have been very active in supplying equipment to operate on both exploration vessels and offshore platforms in an extremely tough environment. For example, during a storm in the North Sea in 1995 the Draupner Oil Rig was hit by a wave 29 meters (95 ft.) high. The most recent Norwegian offshore field to be developed, Snow White, is located well north of the Arctic Circle.



*Typical North Sea applications*

Machine designers for this equipment have to allow for violent motion, extreme temperatures, a corrosive environment, the presence of gas and increasingly stringent government safety regulations. As a result personnel are no longer permitted on the so-called "drill floor" during operation, meaning that much of the machinery has become highly automated. Often machines moving loads of up to 13 metric tonnes (28,660 lbs.) have more similarity to giant robot's arms than simple cranes.

### The Moog Solution

Much of this machinery is hydraulic and Moog has been supplying both Servovalves and Servo-Proportional valves since the early 70's. These have been used on a wide range of equipment including pipe handlers, riser tension systems, top compensators, and mechanical roughnecks. Initially these valves were intrinsically safe versions of our standard products but more recently Moog has developed special flame-proof versions of both D63X Direct Drive and D66X High Flow Servo-Proportional Control Valves. These are classified according to the ATEX directive (See Note below) as Ex 2G EEx d IIC:

The picture shows a group of the flameproof valves supplied to our Norwegian distributor Hydronic A/S for use on a pipe handler. Note the robust housing for the integrated electronics. This is necessary to meet the ATEX directive but it also provides environmental protection permitting the use of standard components in these extreme environments.C2H2T5.



*ATEX certified flame-proof Servo-Proportional valves*

# Moog Explosion-Proof Direct Drive Servovalves Control Particleboard Press:



*ContiRoll-Press, G. Siempelkamp GmbH & Co.*

## Background

Particleboard, a form of composition board, is made by binding wood particles together with a suitable adhesive and pressing or extruding them to form sheets. Particleboard is used as a cheaper substitute for plywood in some applications, even though it has a higher density. When properly veneered it is suitable for making furniture. These boards are produced by continuously working Particleboard Press Systems that produce endless pressed boards in consistent high quality. The Continuous Particleboard Press System is the main and most critical operation in the processing plant.

Production of particleboard involves the processing wood particles the size of flakes that also create sawdust. The presence of dust results in a hazardous environment for press systems that is potentially explosive. In addition, such press systems are frequently damaged by fire. Consequently, members of the European particleboard industry and the European regulatory bodies are working on an agreement on how to classify the environment for these machines according to the ATEX Directive (See Note below). It is very likely that the Particleboard Press System will be classified according to the ATEX Directive as Ex II 3 D, which entails that all the hydraulic valves have to be approved as explosion-proof according to this Directive.

Note: ATEX 94/9/EC is the European Directive for equipment intended for use in potentially explosive atmospheres. Directive 94/9/EC is a designed to harmonize directives meaning it will replace existing divergent national and European legislation, which cover the same subjects. For more information, see [europa.eu.int/comm/enterprise/atex/guide/chapfour.htm#4.4](http://europa.eu.int/comm/enterprise/atex/guide/chapfour.htm#4.4).

## The Moog Solution

A continuous particle press system has 3 main sections, which are electro-hydraulically controlled by Moog Direct Drive Servovalves (D633 and D634 Series):

- 1. Prepress section** - Moog Servovalve supplies position and force control (4 actuators)
- 2. Main press section** - Moog Servovalve supplies position and force control (up to 90 actuators)
- 3. Edge control section** - Moog Servovalve supplies position control (4 actuators)

At the request of a customer, who is seeking the ATEX classification, Moog modified and approved the D633 and D634 series servovalves according ATEX Ex II 3 D, as well as Ex II 2 D (one class higher than required for Particleboard Press Systems).

## Conclusion

Moog has an extensive offering of products that are explosion-proof and suitable for a range of environmental hazards including Servovalves, Servo-Proportional valves, Servomotors, Servodrives and electric actuators. Our history of working in the world's most demanding applications means we have vast experience customizing products to ensure that they meet our customer's needs.

In the case of explosion-proof products we also work closely with the appropriate regulatory agencies around the world to help our customers meet all safety requirements as well as their own goals for machine performance. Our global scope also enables us to interface with the requirements in specific part of the world and provide our customers with confidence that wherever the product is sold or used, they have a knowledgeable partner to help.

### *About the Authors:*

**Martyn Waddington** has worked for Moog for 38 years in a number of management functions and locations. His current position is Marketing Manager with responsibility for the distribution for Moog industrial hydraulic products in Europe.

**Bernhard Zervas** has been the Manager, Systems Engineering for Moog's Industrial operations in Germany for 3 years. He has over 30 years experience in the international hydraulic industry, with a focus on industrial electro-hydraulic closed-loop, electro mechanical and hybrid applications.

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## Did You Know?

### Motion Control Solutions for Hazardous Environments

[Products](#) | [Applications](#) | [Conclusion](#) | [Author](#) | [Appendix A](#)

A purple rectangular box with white and yellow text. The text reads: "Did You Know? Motion Control Solutions for Hazardous Environments".

The evolution of safety standards for explosive environments was initially driven by coal mining disasters in the early part of the 20th century. Since that time a range of solutions and standards has evolved to minimize the chance of an explosion in the presence of gases, vapors, flammable liquids, combustible dust, or easily ignitable fibers. Moog has had extensive experience with the design and testing of intrinsically-safe products since the early 1960's for coal mining radios and hydraulic valves for mining and turbine actuation.

Methods for protection are based on three levels:

- Primary protection limits the quantity of a potentially explosive mixture
- Secondary explosion protection prevents ignition sources
- Tertiary limits the effects of an explosion if the other two cannot be implemented.

Explosion protection is based on the use of approved control devices and their interconnectivity into the total system.

For motion control solutions, users employ a mixture of methods that typically focus on combinations of intrinsic-safety and explosion/flameproof measures.

## Products

### 1. Intrinsically-Safe [IS]:

These devices operate at levels of electrical power [V, I] below 'explosion limit' curves for the particular hazardous gas or dust environment. They provide the highest level of protection for the most demanding environments defined by the various global standards. The relatively low power allowance means that the device should have inherently low electrical operating power. The Moog 2-stage Servovalve employing a nozzle-flapper hydraulic amplifier has been used for many years on applications such as gas turbines due their low power.

Moog offers a broad range of intrinsically-safe valves based on standard industrial designs but with special coils and cable connections. They are identified by the "K" in the model code and include: 631K, 72K, 770K, 78K and 760K series Servovalves and Servo-Proportional valves with flows to 200 l/min [53 gpm].

IS devices are compact and use small diameter cabling. Connections to Ex enclosures via IS barriers will complete the installation. Moog's IS servovalves are found in power generation, chemical processing, oil exploration and wood products industries. See simplified drawing of D631K in APPENDIX A.

### 2. Explosion-Proof /Flameproof:

Tertiary explosion protection is provided by enclosing conventional devices in a special housing. The explosion proof housing will allow hazardous gas mixtures to enter the housing and to be ignited, however the energy of the resulting flame is dissipated through a controlled gap to prevent ignition of the general hazardous area outside the enclosure.

The major advantage of the explosion-proof approach is that standard industrial products can be used and only the enclosure is customized.

Moog motion control devices include:

- Direct Drive Servovalves D633K and D634K for flow rates to 100 l/min (26 gpm).

See simplified drawing of D63XK in APPENDIX A

- Servo-Proportional Valves D660K up to 2000l/min [530 gpm]



- Brushless Servomotors G490 series



- Power Generation Electro-Mechanical Actuators

Applications include electro-mechanical actuation for turbines and higher flow handling and automation for offshore oil and gas production.

### 3. Additional Product Requirements:

Apart from the basic electrical considerations there may be additional factors to be applied to the product to suit specific installation approvals.

- Local variations to approvals – can be related to State, regional, or industry specific issues
- Cable and cable gland requirements
- External materials to resist sparking due to striking (aluminium content) or build up of static charge (conductivity of plastic housings)

### 4. Control System Electronics:

Proprietary approved enclosures are available for safe housing of standard motion control system hardware such as PLC's, servo amplifiers and related electrical and electronics to complete the system. Fieldbus interfaces (Sercos, CANopen, Ethernet) are possible as part of an overall control strategy.

For IS products the electronics I/O will be connected to the enclosure via approved IS barriers. These barriers limit short circuit current and open circuit voltage to below prescribed operating limits for the particular hazardous environment.

Explosion proof products are connected with approved cables and cable glands at the enclosure.

## Applications

Globally our hydraulic and electric controls are applied in a broad range of applications from grain handling conveyor with dust ignition proof Servo-Proportional valves in Australia to IS solenoid valves for ballast regulation on oil & gas tanker ships in Singapore to underground coal mining in Europe, USA, Australia and China.

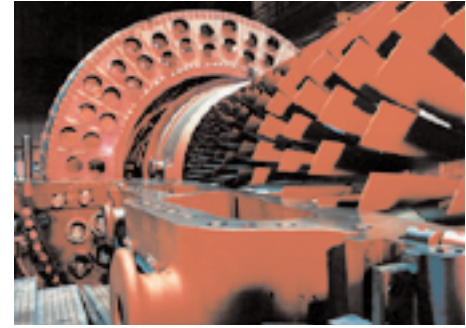
- Component handling fixture with 4-axis for spray-painting line. Application called for a Moog Brushless Servomotor G492K206



- Drive electronics DACS2000 in remote explosion-proof enclosure.



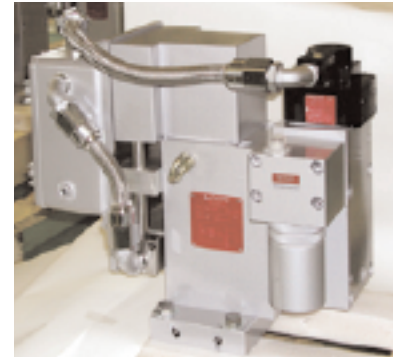
- Steam turbine in oil refinery meant that although the fuel is inert, the installation at a refinery required protection to Class 1 Zone IIB H2.



- These upgrade servo actuators run on 5 bar lube oil and feature Moog's Ex direct drive servovalve for position control on both inlet and outlet turbine regulation valves.



- Moog developed a new explosion-proof actuator for gas turbine fuel control and inlet guide vane (IGV) actuation use. This utilizes Moog's 760N/78N explosion-proof servovalves with explosion-proof junction box, LVDT, and conduits. The explosion-proof design removes the requirement for zener barriers. The junction box simplifies the wiring process. Moog started series production in Japan in 2004 and to date has supplied more than 300 units. These are used in projects in China and Europe, which has adopted the ATEX Directive.



## Conclusion

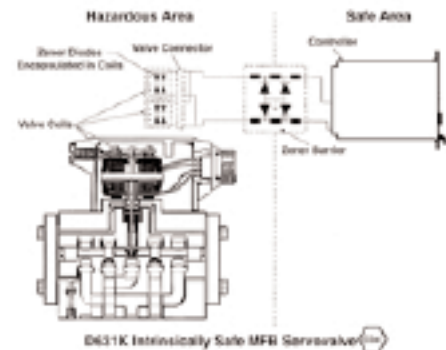
Clearly the selection of products with existing certification will save time and money for a project. Moog has a strong history for support of such solutions with a comprehensive range of hydraulic and electric motion controls certified globally to requirements such as CE, FM, ATEX and UL.

### *About the Author:*

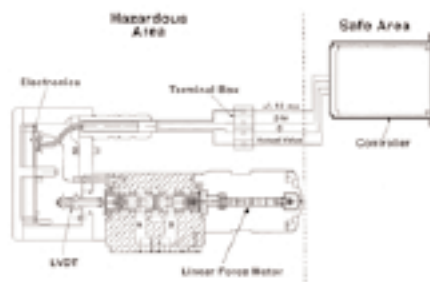
**Roy Park** has 32 years experience in engineering, marketing and management in the hydraulics industry, including the past 21 years as Managing Director and Site Manager for Moog Australia. He has a B.E. honors degree in mechanical engineering from Monash University.

## Appendix A

### D631K Intrinsically-Safe Servovalve



### D63XK Flame-proof Direct Drive Servovalves D633K and D634K for flow rates to 100 l/min [26 gpm]



D63XK Flameproof Direct Drive Valves

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## Hot Websites

### Europa, FM Global, CSA and TIIS



#### [Europa - The European Union On-Line \(europa.eu.int/comm/enterprise/atex/indexinfor.htm\)](http://europa.eu.int/comm/enterprise/atex/indexinfor.htm)

This direct link to the European Commission's website speaks directly about equipment intended for use in potentially explosive atmospheres (ATEX). It gives relevant information on the implementation and application of the Directive and guidelines on how to apply the directive in your situation.

#### [FM Global \(www.fmglobal.com/scripts/store/item\\_details.asp?catid=50&prodID=86\)](http://www.fmglobal.com/scripts/store/item_details.asp?catid=50&prodID=86)

Visit FM Global to order a free color poster which explains the difference between the two methods used to classify hazardous locations. This site lists valuable information you do not want to forget: explosion-proof markings, protection concepts, area classifications, apparatus groupings, acronyms, ingress protection (IP) codes, and more.

#### [CSA \(www.csa-international.org\)](http://www.csa-international.org)

CSA offers a complete guide to Canadian Explosion-proof Standards.

#### [TIIS \(www.anky.or.jp/index\\_e.html\)](http://www.anky.or.jp/index_e.html)

TIIS (Technology Institution of Industrial Safety) is a test/certification body in Japan with information on explosion-proof directives.

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## Product Spotlight

### Explosion-Proof Electric Motion Control Products

[Explosion-Proof Servomotors](#) | [Linear and Rotary Electro-Mechanical Actuators](#) | [Electric Inlet Guide Vane \(EIGV\) Servoactuator](#) | [Conclusion](#)



Moog's range of products for hazardous environments includes Servomotors and Electro-Mechanical Actuators. Many of these explosion-proof products are ATEX and TIIS certified and so that they can be customized for your particular requirements.

Moog has special explosion proof rated brushless Servomotors in size 3 and size 5. Flameproof Housing: Proven capability to withstand internal explosions without bursting or allowing ignition to reach outside the servomotor frame.

- **Compact Design:** Through the use of high-energy magnets, high fill factor stators, and a thermally efficient aluminum case these servomotors are among the industry's highest power density. The compact design increases design flexibility by allowing you to put power where you need it.
- **High Dynamics:** Combining the high power density package with a low inertia rotor allows this series of servomotors to deliver rapid load acceleration and acceleration to reduce move time.



Summary specifications for the range of size 3 servomotors (G493 series):

- Continuous Stall Torque from 0.60 Nm to 3.70 Nm
- Peak Stall Torque from 1.50 Nm to 13.00 Nm
- Nominal Speed from 8800 rpm to 3900 rpm

Summary specifications for the range of size 5 servomotors (G495 series):

- Continuous Stall Torque from 5.80 Nm to 25.00 Nm
- Peak Stall Torque from 12.20 Nm to 60.00 Nm
- Nominal Speed from 4800 rpm to 2200 rpm

## Linear and Rotary Electro-Mechanical Actuators

- This linear explosion proof actuator for the power generation market was customized for a particular customer from our MaxForce 880 line of Electro-Mechanical Actuators. This product fully integrates a Moog servomotor with our linear actuator to provide a compact, efficient design. This linear Electro-Mechanical Actuator (885-007A) manipulates the linear process control valve that controls fuel flow in power turbine parts.



Summary specifications for the Linear Electro-Mechanical Actuator 885-007A

- Speed at rated force: 11 in/s (280mm/s)
- Continuous Force: 400 Lbf (1.8 kN)
- Peak Force Capability: 800 Lbf (3.6 kN)
- Back-drive Force: 35 Lbf (156 N)
- Temperature Range: -40°F to 180°F (-40°C to 82°C)
- Certifications: ATEX & CSA
- Power: 90-150 VDC

The Rotary Electro-Mechanical Actuator (880-018) controls rotary control fuel valves in a hazardous environment. Its compact integrated approach is specifically designed for high temperature environments.



Summary specifications for the Rotary Electro-Mechanical Actuator 880-018

- Peak Speed: 12000°/sec (2000 rpm), limited by controller to 200°/sec at 30 in-Lbf (3.39 Nm) load
- Continuous Torque: 55.5 in-Lbf (6.3 Nm)
- Peak Torque: 158 in-Lbf (17.8 Nm)
- Gear Ratio: 4:1
- Backlash:  $\leq 3$  Arc Min
- Back-drive Torque: 13 in-Lbf (1.5 Nm)
- Temperature Range: -40°F to 180°F (-40°C to 82°C)
- Certifications: ATEX & CSA
- Power: 90-150 VDC

## Electric Inlet Guide Vane (EIGV) Servoactuator: (885 series)

- Designed for small aeroderivative turbines, this is an example of an explosion-proof product that has been highly customized for a specific application.
- With this electric solution the customer has eliminated various hydraulic plumbing issues including leaks, maintenance costs and cleanliness. This actuator also utilizes our brushless servomotor technology with the highest power density in the industry
- Moog integrated ballscrew and rotor design yields compact size and excellent dynamics due to reduced inertia. This also leads to better reliability due to the elimination of couplings and redundant bearings
- The Moog integrated electrical housing allows for ease of installation and maintenance



Summary Specifications

- Full stroke step time @ nominal working load: <1 second (80mm/s max velocity)
- Nominal working load: 1.4kN
- Peak working load: 4.5kN
- Environmental Temp: -20°C to 80°C
- Power Supply: 24 VDC nominal

## Conclusion

Moog's Servomotors and Servoactuators for use in hazardous environments can be found in applications such as enameling, chemical, and turbine industries.

Moog also have a full line of servodrives that will complement the above explosion-proof electro-mechanical actuators. They are designed to fully integrate and enhance your application's total performance.



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## Ask the Expert

### Guidelines for Hazardous Environment Product Selection

How do you know if an environment requires special electrical or hydraulic safety equipment? When it is required, how do you select the right type?



There are no easy answers to these questions, but here are some guidelines to help.

- There are different directives for hazardous environments depending the part(s) of the globe where the apparatus is to be employed. For example, the United States directive is different from Europe, which is different from Canada, which is different from the Pacific. Each country and industry many require unique or multiple approval markings.
- If you are working in areas with vapors, dust, or fibers, your application is associated with a specific zone or division. The exact type of vapor, dust or fiber narrows the safety approval to a particular group. If this has not sufficiently confused the issue, you still must determine what the maximum operating temperature will be.



**DO NOT GIVE UP!** These questions have been asked many times over, consequently many charts and roadmaps exist to help with these issues. There are many good websites with a wealth of information and background materials on the regulations in each country. ([See Hot Websites](#))

- The energy levels and response time requirements and cost issues must always be considered when selecting the right product. For example, "over-protection" may be the best option when only safety is considered but it may come at a high additional cost. Each factor must be carefully considered when arriving at the optimal solution. Many of the approval agencies and safety product manufacturers will provide hands-on assistance to help you plan your overall system. A well-designed system is the goal and there are many resources to help.
- When you have identified the correct classification you will need, you can call a Moog application engineer in your local area to determine which product best suits the project at hand. With vast experience in designing, testing and applying products, Moog can work with you to customize solutions that will meet your needs.

For more information please visit [Explosion-Proof Products for Potentially Hazardous Environments](#)

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## Upcoming Events

Please visit the Moog booth at:

- Hannover Industriemesse, Hannover, Germany (April 11-15, 2005)
- ITEC 2005 Defense/Training/Simulation, Amsterdam RAI International Exhibition & Conference Centre, The Netherlands (April 26-28, 2005)
- BrasilPlast, International Plastic Industry Trade Forum, Anhembi Park, Sao Paulo, Brazil (April 4 - 8, 2005)
- SimTect 2005, Simulation Conference and Exhibition, Sydney Convention and Exhibition Centre, Sydney, Australia (May 9 - 12, 2005)

For more information, click on [Exhibits and Trade Shows](#).

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## Moog Training Sessions

Software training: Introduction to MACS / IEC 61131 Programming (2.5 days)

- 26 - 28 April 2005: English Language Session
- 19 - 21 April 2005: German Language Session

MSC - Moog Servo Controller Hardware and Extension Modules (1.5 days)

- 28 - 29 April 2005: English Language Session
- 21 - 22 April 2005: German Language Session

Seminars are held at Moog GmbH in Boblingen, Germany (near Stuttgart).

For more information, click on [Training Opportunities](#).

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## Other Moog News

For the latest [Press Releases](#) and [Published Articles](#) concerning Moog please click on [News](#)

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