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ARGO-HYTOS: Creative and innovative solutions Hydro-pneumatic suspensions Innovative hydraulic tanks Focus: Construction machines

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#### Dear Reader,

One of the most important events for our industry is right in front of us: Every three years the community of construction equipment meets in Germany for the world famous BAUMA in Munich. Still the biggest show of its kind in the world. You can see, touch and test the whole amazing variety of construction equipment, mostly driven by hydraulics. One can experience the creativity and ingenuity of engineers in finding solutions for all different kind of tasks in this customer's industry. But BAUMA is a great social event, too, celebrated with a lot of Bavarian beer, sausages with sauerkraut and music. Come and see us at ARGO-HYTOS in hall 4 booth 502.

ARGO-HYTOS has been participating in BAUMA Munich for many years now by offering a show case of innovative and creative products and system solutions for the construction equipment industry.

Our FLASH – in its new design – offers you a quick reference guide to products, systems and application solutions for our industry, not only following the trend but trying to define the way to go. This edition of the Flash Magazine also gives you information about another big trend in our industry: Comfort and safety. A complete vibration-free working environment for the operator is certainly an illusion in off-road equipment, but we can do a lot to improve the environment of the workplace for operators. See how we deal with this challenge with our modular hydro-pneumatic damping system.

This time we want to introduce you our company in Poland. A young and motivated team takes care about our customers in industrial and mobile industry. Since the opening of our new factory three years ago, ARGO-HYTOS Poland has been producing power packs, customized hydraulic manifolds and our Fluid Management product range in Zator, close to Krakow. Get going guys!

May I introduce you some very important persons: Our service team at ARGO-HYTOS in Germany! In many cases they are the most competent and pleasant face to our customer.

Many more information is available in our FLASH magazine introducing BAUMA. Nevertheless, the best way to get on site information, is to visit us in Munich!

Be welcome and join us at least for a "beer after 4"! See you and "PROST"!

BAUMA: Come and see us at ARGO-HYTOS in hall 4 booth 502 Best regards

Christian H. Krenzle CEO ARGO-HYTOS Group

# JCB & ARGO-HYTOS, A Bilateral Cooperation for Creative and Innovative Solutions



Matthias Vorbeck, Head of Global Sales & Marketing ARGO-HYTOS Group

"Pro-active advice on technology trends as well as the understanding of the pronounced as unarticulated needs of our customers shows our solutions expertise."

#### Innovation meets construction machinery

As ARGO-HYTOS, we stand for best serving our customers in the mobile and industrial hydraulics with innovative components, systems and services. System orientation, application expertise, creativity and requirements-based design are keywords that we adopt as our own when it comes to develop pioneering solutions together with our customers. Matthias Vorbeck, Head of Global Sales & Marketing, ARGO-HYTOS Group underlines: "Thereby, we always see ourselves as a partner from the idea until series production. This requires close interaction between sales, application engineering, product management and development to manufacturing technology and logistics."

Pro-active advice on technology trends as well as the understanding of the pronounced as unarticulated needs of our customers shows our solutions expertise. So, creativity in the qualifying designing of the solutions and the constant questioning of what already exists, are an absolute must both within ARGO-HYTOS as well as in interaction with our customers. Our innovation stands for making "tomorrow" a bit better than "today". The long-term, sustained and stable customer relationship is the goal. This objective is achieved when we have managed to develop the operational and strategic value-adding customer benefit and the customer honors this with: "order placed". We have just written this success story together with the internationally operating construction machinery company JCB.



#### Background

Skid steer loaders are among the most versatile pieces of equipment on the market today. That versatility stems from the core of these machines their hydraulic systems. The hydraulic system is used to drive the machine, operate the loader and attachments, provide dynamic braking and lubricate components. A fair share of maintenance cost is centered on the hydraulic system. Proper maintenance and care of skid steer loader hydraulic systems is crucial not only for the longevity of the machine, but also for keeping costs and downtime to a minimum. While many brands of skid steer loaders may appear similar and have similar components, there can be differences in how to service their hydraulic systems properly. Hydraulic systems in skid steer loaders can be rather complex due to the compact space available. Service availability is a premium. Contamination is the single biggest reason why hydraulic components fail, most of the time, this can be prevented.



## Challenges

ARGO-HYTOS was approached by JCB at the ConExpo in Las Vegas to forge a partnership for the purpose of designing a tank solution for their Tier 4 updates. JCB was well-aware of ARGO-HYTOS' reputation as an industry wide leader for innovation and creative design solutions to customer challenges. Engineers from ARGO-HYTOS wasted no time working in parallel with JCB's engineering team to address their requirements and the issues faced. Among those requirements were incorporating return filters, suction strainers, breathers, sight gauges, fill ports, and to implement a clever quick disconnect fitting for installation. Additionally, all of those design elements were to fit into a space that would be accessible for serviceability and maintenance concerns and also pass an SAE service audit. ARGO-HYTOS formed a bilateral team composed of ARGO-HYTOS Design Engineers and Project Management and JCB Engineering and Supply Base Management to generate a total system "plug and play" solution.





## Innovation Award from JCB

## Results

The outcome of both company's cooperation was a composite tank geometrically designed to meet the customer specifications on space requirements which achieved all of the design targets and goals. The tank is also considered to be at a higher level of serviceability than competitor machines based on SAE service audit scores. The endeavor also resulted in patents for protective elements and the disconnect coupling that were designed for ease of assembly. The benefits for JCB's supply chain arise from the fact that the tank system is all-encompassed into one part number for ease of traceability and inventory management and that the price that met their targets for our integration of filter, strainer, breather, sight gauge into the tank design with internal baffles to reduce aeration of oil. The competence of ARGO-HTOS in designing composite tank and filtration systems was the key for this system solution.

### Honors

JCB celebrated the success of the project by awarding ARGO-HYTOS the certificate of Achievement of Innovation for the cost-saving initiatives and the all-inclusive composite tank design solution. Together in partnership, creative solutions to highly technical design and specification requirements are possible.



Larry Gerken, Vice President & General Manager ARGO-HYTOS North America

"Together in partnership, creative solutions to highly technical design and specification requirements are possible."

# **ARGO-HYTOS Poland Presents Itself**



Arkadiusz Noworyta, General Manager ARGO-HYTOS Poland

"Acting not only as a supplier but also as a service team, we are even closer to our customers, getting better understanding of their needs."

## Mr. Noworyta, would you please describe us your company? Where is it located, how many people work there?

We are situated in the small but fast developing town Zator in the south of Poland. This location gives us a lot of advantages:

- It is close to Upper Silesia and Lesser Poland the most industrialized regions of Poland
- > In a range of 60 km there are three prestigious Technical Universities
- We are located in a special economic zone which is a part of Cracow Technological Park – one of the fastest developing industrial areas
  - Close to A4 motorway crossing Poland from Germany to Ukraine and close to Cracow airport

It gives us not only a good starting position but also a big chance for further development.

Additionally, this part of Poland is also well known and very interesting from a touristic point of view, both due to its history and its nature.

Two years ago, we moved to a brand new ergonomic building. While designing it, we took full advantage of the experience acquired in the ARGO-HYTOS Group during several construction phases all around the world. These helpful hints were complemented by our local creativity. During a series of meetings and discussions, sometimes very hot and emotional, step by step we were shaping and improving our ideas. It really isn't an overstatement to say that almost every member of the ARGO-HTYOS Poland team contributed in final effect to this development.

We have a team of 26 full-time employees. The staff is relatively young but already experienced, both from technical and marketing point of view. Additionally, we have 4 young students in training – one of the advantages of the close cooperation with the local technical school – a kind of our investment in the future.

During 10 years on the market we have built a net of 12 dealers covering all most important parts of Poland. Through this channel we generate about 30% of our turnover. The rest of the business is run directly with OEM's or end users.

## Which product lines do you produce?

We have been developing our own production since the very beginning in 2006. At the start it was just the assembling of small tailor-made powerpacks and manifolds. Very soon we started to receive inquiries for more and more complicated hydraulic and lubrication systems. During the last 10 years we have gathered considerable experience and now we are able to design, produce and put into operation even quite sophisticated systems. This knowledge and understanding collected in systems fields is also very helpful in the efficient sale of components. It is highly appreciated by our customers – we are able to give them real technical support.



ARGO-HYTOS Poland building





ARGO-HYTOS Poland building

Line for metal sheet perforation, driven by hydraulic systems, designed, built and put into operation by the ARGO-HYTOS Poland team

Now, beside standard trade activities we can distinguish three main product lines:

- Designing and assembling of hydraulic and lubrication systems this is the fastest developing part of the business. The biggest parts are small and medium units but we are also able to produce power packs up to 2000 I tanks and 55 kW power.
- Fluid Management products by now we have already moved the production of portable units to Poland and until the end of 2016 it is planned to produce also a range of stationary aggregates.
- > Hydraulic blocks machining we have two DMG five-axis machines running in two shifts six days a week.

## Can you describe us one of your recent customer success stories?

There were several interesting projects in 2015. One of the most complex ones was the project for the company INMET. We have been developing that business for years, starting just as a supplier of solenoid valves, as an alternative to ATOS. Now we are comprehensive supplier of hydraulic stations and control blocks for their machines. Last year, working closely with INMET, we designed, built and put into operation, lines for metal sheet profiling and perforation. The customer was really pleased with the cooperation, appreciating this solution as the fastest available technology in metal sheet working on the Polish market.

The key success factors were both our engineering competence and suitable ARGO-HYTOS product range. As the line works on high pressure (320 bar) and is extremely fast (full cycle of cylinder below 0.5 s) – in this case only high performance components were taken into account. Oil condition and monitoring were also critical issues. That is why the station was additionally equipped with a set of ARGO-HYTOS off-line filters and oil monitoring sensors.

Another important challenge was the energetic efficiency. Deep understanding of functions and cycles of the machine enabled us to design a tailor-made station with hydro-pneumatic accumulators what dramatically decreased the installed power of the system. Our energy-saving design was highly appreciated and gave us competitive advantages.

And last but not least: constant technical support and service. The machine was not only supplied but also assembled and put into operation by the ARGO-HYTOS Poland team. Delivering a comprehensive solution, reliable on every stage from designing to start-up, was the key to win the project. All settings and the adjustment of the control system took a few long and nervous days – but the final effect was even better than planned.



From left: UMPC, FAPC and manifold

## Can you tell us something about your other production expertise?

Our strongest points in production expertise are still hydraulic, lubrication and filtration systems – as described in above mentioned example. However, there are some important groups of proficiency, developed after moving to the new building.

Fluid Management Products – together with our colleagues from ARGO-HYTOS Germany we are transferring the production of filter aggregates to ARGO-HYTOS Poland. During this project we have been able to go deeply into details and understand these products both from technical and marketing point of view. Thanks to that, we observe a significant increase in the sale of these products in Poland. The transfer is still in progress but our team has a lot of ideas for future development of this segment of business. The second fastest growing competence is the hydraulic blocks machining. The early days of this project were much more difficult than we had expected but after two years we have gathered a lot of experience and we have a significant improvement in results in this business unit. Since the beginning, our main customer has been ARGO-HYTOS Czech Republic whereto we still supply almost 70% of the production. However, our local market is continually growing. We are focusing our marketing activities on a goal of getting more real ALMA projects – where we will supply not just machined blocks but full service starting from design (in Hydroman or Creo), going through machining and including assembling of valves.

And finally the hydraulic service – for the last years we have started to be more active also in this area – as a complementary activity to our main products. It was a natural step in the business development – especially as we have a strong competence and knowledge. At the moment we are concentrating on piping, putting into operation and maintaining our hydraulic systems (including oil service). This part of business is important from the marketing point of view. Acting not only as a supplier but also as a service team, we are even closer to our customers, getting better understanding of their needs.

# ARGO-HYTOS: strong competence



# The Service Team from ARGO-HYTOS: Enthusiastically at Your Disposal!



From left: Martin Pfahler (Head of Department), Bernd Weschenfelder (Service Technician), Marc Manako (Service Technician)

Martin Pfahler and his team are the service experts at ARGO-HYTOS for the product divisions Condition Monitoring and Fluid Management.

## Mr. Pfahler, please present your division to us.

Our department is responsible for the service of Condition Monitoring and Fluid Management products. Ranging from calibrations, through repairs to technical consulting, we provide all services necessary for maintenance and operation of the equipment.

#### Where are your priorities?

The main tasks are within the field of calibration and adjustment of particle monitors and counters.

## What is calibration exactly needed for?

Regular calibration ensures the accuracy and comparability of measurement results. Also with DIN EN ISO 9001:2008 and 2015, the traceability of all measurements to national standards is mandatory. This creates legal certainty with regard to product liability, acceptance tests and assessments. Service Hotline: You can reach us under Tel: +49 7250 / 76 -522 or Email: service@argo-hytos.com

#### Do you offer rental units?

Yes, we offer our customers a solution for every need, beginning with measurement systems, through off-line filter units to complete dehydration systems.

#### What additional services to you offer?

We analyze customer systems and create customized measurement and filtration solutions. Here, the desired filters, sensors, displays including cabling and installation are offered as Plug & Play solution.

# MHPS -Hydro-Pneumatic Suspension in an Articulated Dump Truck





The best way to demonstrate the advantages of the modular concept, is by using the example of a front axle suspension in an articulated dump truck with a production quantity of 15-20 machines per year:

Due to the ever-growing claim on comfort and safety, axle suspensions in articulated dump trucks have for quite some time belonged to the delivery spectrum of the major manufacturers.

In order to remain in business, a small manufacturer has to make large investigations in development times and costs as well as in building up relevant know-how, to come up with a suspension machine. By working together with our application specialists, and through the use of complete MHPS modules, expenditure for development times and for building up know-how can significantly be reduced. Together with the customer, the application team of ARGO-HYTOS prepared an analysis of the current state. On this basis, it was discussed, how to attain improvments, both on economic and technical side.

Systems control block





Schematic diagram

## Info

#### "Only as many valves as the function requires"

In articulated dump trucks, many movements and functions are implemented hydraulically. Some of the key operating functions in an open circuit are:

- > Front axle and / or all-wheel suspension
- Tipping function
- > Steering
- > Pump control
- > Fan drive

Components and control blocks for the implementation of functions can be found in the portfolio of ARGO-HYTOS. Different designs and nominal sizes can be combined to control blocks and multi-flanges in almost any shape. According to the motto "only as many valves as the function requires", ARGO-HYTOS combines in its control blocks valves of different valve kits for technically and economically optimized system blocks. Flanged valves (ISO 4401) and disk valves are used as well as screw-in valves. All valves are designed and manufactured in-house.



Sebastian Fellhauer, Applications Engineering International

"Additional modules can be flange-mounted to or omitted from the existing solution, guaranteeing the highest flexibility even in series production. "

The machine data such as weight of the machine, loading conditions, speed, etc. were the basis for the calculation of the new system.

The design of cylinder sizes, pre-charging of the diaphragm accumulators or cable diameters were made by ARGO-HYTOS, based on these parameters.

Based on the layout, the software has been configured and loaded into the control electronics, the control blocks and other accessories have been compiled. A first functional test was carried out at ARGO-HYTOS, at the load test rig belonging to the company.

Before the system was installed, all basic settings and functions had been tested and checked.

In the next step, the system was installed at the customer's premises and jointly taken into operation. Constantly present: the engineers of ARGO-HYTOS. Therefore fine tuning, such as changing of the valve settings or adapting the software to customer requests, constituted no problems and could quickly and easily be implemented. After final tests and measurements, the final set-up was established and the series production could begin. If special machines should be built over the series, additional modules can be flange-mounted to or omitted from the existing solution, guaranteeing the highest flexibility even in series production.

## ARGO-HYTOS: tested & checked

# Pitching Vibration Damping for Wheel Loaders



Over the past years, the driving speeds of construction vehicles have steadily risen. Even the small and medium sized machines for material handling and transport (e. g. wheel loaders and telescopic loaders) have followed this trend. Today, speeds of over 30 km/h are reached when driving on roads.

If a wheel loader drives over a bump, the resulting shock is transferred from the tire to the chassis, setting the mass of the boom with attachment in motion. This results in dangerous boom oscillation that can negatively affect the driving comfort, the safety and thus the handling performance of the machine. Due to the constructional design and the weight sharing of a wheel loader, damping should ideally take place at the cylinders between the boom and the base vehicle to reduce the effect of the introduced pulse so that the resulting pitching motion of the vehicle remains in the controllable area of the driver.



**Wolfgang Rocca,** Head of Applications Engineering International

"The new ARGO-HYTOS pitching vibration damping system features simple integration and ensures increased material handling performance, driving comfort and safety." In addition, transport goods may be hurled out of the bucket due to strake and jerky movements of the mast.

## Spatially optimized systems

For unsprung mobile working machines, ARGO-HYTOS offers vibration damping systems in different designs and feature combinations. All they have in common is the fact, that the movement of the bucket or boom is decoupled from the vehicle through hydraulic accumulators. Pipe rupture protection and constant accumulator pre-charging can be integrated just as accumulator safety valves and drain valves. The individual functional modules can be combined to a specific control block and easily be integrated into existing hydraulic systems. The installation can be designed both for series production as well as for retrofitting. In most cases, no changes must be made to the existing hydraulic circuits. From simple adding of accumulators over systems with adaptive accumulator pre-charging up to fully integrated systems with pipe rupture protection, anti-cavitation, load-dependent damping and accumulator charging, we can design – together with the customer – the special control block out of individual functional modules which spatially optimized fits into the machine and comprehensively meets the requirements of the customers and the legislature.

## Uncomplicated conversion or retrofitting

As the control block contains all necessary functions, mobile machines can be upgraded or retrofitted quickly and easily. There is no need to readjust the transport position of the bucket or the boom. With the ARGO-HYTOS vibration damping system, the loss of carrying height when driving on roads is a thing of the past, because the manifold does not create additional internal leaks. All that is needed to activate the damping, is an electrical signal, generated depending on the speed or the operator.

## "Total Cost of Ownership"

The new ARGO-HYTOS pitching vibration damping system features simple integration and ensures increased material handling performance, driving comfort and safety. And, since there is less wear on the machine material, the vibration damping systems also contribute to the longevity of the machine and thus help to minimize the "total cost of ownership".

# **User-friendly Control of Construction Machines**



Radek Němeček, Technical Trainer

"Our valves characterize a pioneering design, high reliability and stability coupled with good dynamics."

## Development trends in the construction machine

Performance and security, coupled with an increased operating comfort, define today's development trends while simultaneously reducing operating costs. Progressive approaches in the design of new machines require high-tech products and system solutions, adapted to the intended use. The construction machine stands for the transfer of high powers and forces and is therefore predestined for multiple use of hydraulics due to its high power density, especially in the areas of operational functions, the drive, up to the suspension of the chassis. In this context, electrically controlled proportional valves play an essential role. So, in conjunction with an intelligent and sophisticated control, individual functions can be optimally matched to the assignment. The use of proportional valves makes it possible to divide the control into two basic complexes - in a hydraulic power component, often arranged in the vicinity of a consumer, and an electronic control component in the vicinity of the operator. Both components communicate via electrical control signals. Functional ergonomic joysticks, partly with function display and simulation of a force feedback, enable efficient, precise and convenient operation. For the safety of the machine there are, among others, pressure relief valves with a partly continuous adjustment of the maximum pressures in the hydraulic circuit. In addition, there are proportional pressure reducing valves, which are used for force regulation of the hydraulic cylinders or for regulating the output torgue of hydraulic motors.



#### Proportional control

ARGO-HYTOS offers proportional relief valves which cover a wide range of applications, both in stationary as well as in mobile applications. The valves characterize a pioneering design, high reliability and stability coupled with good dynamics. The two valve series of the pressure relief and pressure reducing valves are pilot operated via a pilot stage. An adequate level of cleanliness of the operating fluid, or which ARGO-HYTOS also offers optimized filter solutions in conjunction with condition monitoring, is a prerequisite for the performance of such controls up to a flow rate of 60 l/min and a maximum pressure of 350 bar.

#### Modular concept

Both types of valves are controlled by the same pilot stage. This modular design of the valves reduces the number of manufactured parts and thus offers in addition to the cost benefits for the customer also benefits in case of service. In addition, the pilot stage may be used separately as a pressure relief valve up to a flow rate of 1.5 l/min at maximum pressure of 350 bar. Three pressure stages 120 bar, 210 bar and 350 bar provide appropriate pressure ranges for optimizing a pressure regulation, exactly adapted to the respective requirements. The valve control itself is carried out by a proportional pressure magnet. In accordance with the customer requirements, there are three electrical connection types available: DIN or the in mobile applications popular DEUTSCH and APM terminals. The control of the electromagnet is carried out via a PWM signal with a frequency of 250 Hz. The possible supply voltage of 12V or 24V is compatible to the normal mains voltage of construction machines. A built-in suppressor diode protects the control electronics against induced voltage spikes.

For valve control, it is recommended to use the miniature electronics EL6 in the form of a DIN cable socket, which is placed directly onto the valve. The miniature electronics provides a modern compact solution for valve control and enables a simple parameter setting with two knobs and a built-in display, e.g. with ramp functions. In the development of the valves, the operating conditions of construction machines were significantly focused: the operating fluid temperatures from  $-30^{\circ}$  C to  $+90^{\circ}$  C and kinematic viscosity of the operating fluid from 10 to 500 mm<sup>2</sup>s<sup>-1</sup> are covered as standard. Furthermore, they optimally withstand occurring vibrations. The pressure reducing valve is designed as a 3-way valve. In addition to the retention function at the valve output, the valve provides a protective function of the connected consumer. If there is an overload of the consumer, which may – with construction machines – occur determined by the function, the valve closes the flow and connects the consumer to the tank. This leads to a reduction in order to prevent damage to the consumer by high pressure.







Speed control of a fan drive by means of the proportional pressure valve

## SRN4P1-B2 - A valve with a negative characteristic curve

In some technical applications it is necessary that the function of the pressure valve is reversible due to the functional or safety-related requirements of the system. That means that the maximum pressure is reliably achieved even in case of failure of the control signal.

Such requirements correspond to valves with a negative characteristic curve.

An example of the use of a proportional pressure valve with a negative characteristic is the speed regulation of a fan drive in agricultural machinery and construction machinery. The proportional control allows continuous observance of an optimum oil and coolant temperature under all working conditions. Thus, sustainable energy saving and extension of the engine and component lifetime is achieved. The specified temperature is maintained by continuous regulation of the fan speed and thus the cooling air flow. In electronics failure respectively failure of the control signal, the motor is protected from overheating by "fail-safe mode", a characteristic of the curve.

## SR4E-B2 - A valve with combined function

SR4E-B2 is a valve which combines the functions of a pilot operated pressure relief valve with a solenoid operated relief valve. Through the pressure relief function, the maximum pressure is secured in the circulation and thus the circuit is protected against overload. With the switching off of the electromagnet, the pressure line is relieved and connected to the tank. With two adjusting screws, the limit values of the solenoid armature can be set and thus also the minimum and maximum pressure in the circuit. There are three pressure stages available with a pressure adjustment range up to 120 bar, 210 bar and 350 bar. The minimum pressure can be adjusted up to 20 bar. The max. flow rate is 60 l/min. Through this combination valve, the system costs are reduced by eliminating a separate relief valve.



Negative characteristic curve of the proportional pressure relief valve p-I characteristic curve. With increasing value of the control signal, the system pressure in the circuit reduces

## Sustainable energy saving



Pilot operated pressure relief valve in combination with an electromagnetically actuated unloading function (SR4E-B2).

## Valves for gear and clutch control

An important area, in which hydraulic valves are applied in mobile machines, is the control of gears and couplings. For the coupling circuit, mainly pressure reducing valves are used. For this application, ARGO-HYTOS offers specially tuned valve solutions: Pilot operated proportional pressure reducing valves with a special characteristic curve, designed for mounting in control blocks or directly in the gearbox. The valves are designed as 3-way valves, and thus also include a protective function against overload of the hydraulic circuit. There are two versions available: SP4P1-B4 with thread 7/8-14 UNF and PP4P1-Z3 as "slip-in design". On request, the input channel can be provided with a filtration screen in order to ensure the functionality even with contaminants. The coils of the electromagnets are available with DEUTSCH and AMP connectors, possible supply voltages are 12V or 24V. An inlet pressure of up to 50 bar, an output pressure up to 25 bar, max. flow rate of up to 40 l/min, are parameters which are adjusted to the use in transmissions for mobile applications. These valves provide high switching speeds at safe and stable function over a long service life.

The 3-way cartridge spool valve PD 2-E in "slip-in" design is often used for transmission controls in mobile applications. The shaped holes of the directly controlled proportional pressure reducing valve PP2P3-W are identical to the s/w switch valve PD2-E, so that for system integrators the number of molds can be minimized.



Transmission control block





# High Pressure Safety Filter HD 305 with Reversing Control

In vehicles such as loaders, which have a hydraulic quickchange system, combined with a hydraulic clutch system, high pressure safety filters from ARGO-HYTOS can ensure cleanliness in the system. Manufacturers of such machines are looking for solutions that prevent dirt from the tool, e.g. large particles, from entering the individual hydraulic components what may lead to massive damage or even total failure. The vehicle hydraulics must be protected – regardless of the affiliated tool.

In view of these requirements, ARGO-HYTOS provides the perfect solution with its new half reversible high pressure safety filter HD 305.

The filter is per function, e.g. gripper open/closed, integrated in the two lines to the consumer (scissors, gripper etc.). For each line there is a separate filter with reversing unit available, which is hydraulically isolated from the other.

The oil flowing to the consumer is allowed to pass through in unfiltered condition. The returning oil from the tool is led through the filter element.



HD 305



## Overview

#### Features and benefits at a glance:

- > Compact design
- > High pressure filter with reversing control pressure filter for two separate circuits
- > Protection of the vehicle hydraulics regardless of the affiliated tool
- > Nominal flow up to 300 l/min
- **>** Filter fineness 60 μm
- > Operating pressure up to 400 bar

## Cleanliness in the system



**Rafael Kaliciak,** Product Management Filtration

"ARGO-HYTOS provides the perfect solution with its new half reversible high pressure safety filter HD 305."

# Return-Suction Filters – New Catalog Series for In-line Mounting



**Steffen Kemmling,** Dipl.-Ing. (FH) Head of Product Management Filter Systems

"If the design criteria are taken into account, you can take full advantage of the benefits provided by the return-suction filter concept." Particularly in self-propelled machines such as wheel loaders, pavers or mowers, which are equipped with a hydrostatic drive (closed circuit) and combined working hydraulic system (open circuit), the filter concept furthermore often consists of a return filter (working hydraulics) and a suction or pressure filter (hydrostatic drive).

At the above mentioned machines, return-suction filters replace the required suction or pressure filters for the feed pump of the closed hydrostatic drive and the return filter for the working hydraulics in the open circuit. Compared to these filter concepts, often also a cost reduction can be achieved.

The use of a return-suction filter offers far-reaching functional improvements and for example, the following advantages:

- > Only one filter for both circuits
- > In both circuits, the total oil volume is filtered in the return line
- Continuously more oil is flowing in the return line than it is taken off via the suction line
- > Excellent cold start behavior, since the feed pump sucks oil which is pressurized by a check valve
- > The feed pump is always supplied with filtered oil. A pressure relief valve is installed to protect the shaft seals against overloading

## Function



**Only one filter** 

for both circuits

The hydraulic oil returning from the circuit (R) passes the filter element (1), is pressurized by a 0.5 bar check valve (2) and supplied to the feed pump (S). The surplus oil flows filtered over the integral check valve into the reservoir (T). As the feed pump is always fed with pressurized oil, the risk of cavitation is minimized and full performance is available even during the critical cold start phase.

An integral bypass valve (3) in the filter element (1) prevents too high back pressure (e.g. with cold start or contaminated filter element).

A bypass valve protection strainer guarantees that – under no circumstances - unfiltered oil can get into the feed pump.

While with the use of separate filters, both circuits operate independently from each other, the combination of the two circuits via a return-suction filter causes interaction between the circuits. If the design criteria described below are taken into account, you can take full advantage of the benefits provided by the return-suction filter concept.





E 178 and E 088

## Required return flow in the system

In order to maintain a pre-charging pressure of approx. 0.5 bar at the intake of the feed pump, the return flow must exceed the suction flow under any operating condition.

## Permitted flow rate of the feed pump

- At operating temperature and rated speed, the volume flow of the filling pump should not exceed 80% of the nominal volume flow rate of the filter (e.g. with a return-suction filter with a nominal volume flow / return flow of 200 l/min, the volume flow of the filling pump should not be higher than 160 l/min).
- > At extreme cold starts ( $v = 1000 \text{ mm}^2/\text{s}$ ) and slightly increased idle speed (n = 1000 min<sup>-1</sup>), the volume flow of the filling pump should be  $\leq 80\%$  of the return flow.

## Pressure loss in the suction lines

Under above mentioned cold start conditions, the pressure loss in the suction lines must not exceed 0.4 bar. This ensures that the filling pump is supplied with sufficient oil even with a partly contaminated filter element.

## Backpressures in system return lines

When the drain oil from the hydrostatic drive is routed across the filter, the permitted leakage oil pressures have to be observed in order to protect the shaft seals. Here, besides the backpressure of the filter, also the pressure loss caused by the leakage oil pipes and the oil cooler are to be considered.

Depending on the application, the use of a cooler bypass valve is recommended.

## Filter fineness and oil cleanliness grades

As standard, for all return-suction filters two ARGO-HYTOS filter grades are available: 10EX2 and 16EX2. Both with the patented EXAPOR®MAX2 design. The following oil cleanliness according to ISO 4406 can be achieved:

>	10EX2	18/15/11	14/11/7

> 16EX2 20/17/12 ... 17/14/10

The manufacturers of hydrostatic drives mostly recommend for normal operation an oil cleanliness of 20/18/15 and as of 19/17/14 for increased requirements (t > 90 °C). Even with the filter fineness 16EX2 these requirements are met by 100%.

## Installation example



## In-line mounting

So far, return-suction filters have only been offered as tank top mounting version. As particularly with compact machines the tank often is difficult to achieve, ARGO-HYTOS as only manufacturer to date has developed return-suction filters for in-line mounting. These in-line mounting versions can be integrated in a readily accessible place in the return line and suction line.

	E 068 / E 088	E 178 / E 258
Nominal flow	up to 100 l/min, two length variants	up to 250 l/min, two length variants
Filter fineness	10EX2 and 16EX2	10EX2 and 16EX2
Operating pressure, max.	10 bar	10 bar
Bypass valve cracking pressure	2.5 bar	2.5 bar
Bypass valve protection strainer	mesh size 125 µm	mesh size 200 µm
Return connections	G ¾ (1x)	G1 (4x)
Suction connections	G ¾ (1x)	G1 (3x)
Tank connection	G <sup>3</sup> ⁄ <sub>4</sub>	G1
Clogging indicator ports	M12x1.5 (plugged) (2x)	M12x1.5 (plugged) (2x)

# Innovative Hydraulic Tank with Integrated Return Filter



With increasing demands on function integration and cost efficiency, plastics as a material for tank production are becoming increasingly important. In addition, designers expect almost unlimited creative freedom. Meanwhile, numerous methods for tank production have been developed; the advantages and disadvantages of the most common methods should here be briefly compared.

## On the market already established technologies in comparison:

- > Welded steel tank
- > Rotationally molded plastic tank
- > Blow molded plastic tank
- > NEW: ARGO-HYTOS injection molded plastic tank

	Welded steel tank	Rotationally molded plastic tank	Blow molded plastic tank	NEW: ARGO-HYTOS ARGO-HYTOS injection molded plastic tank
Tank volume	Suitable for large and small tank volume	Suitable for large and small tank volume	Suitable for large and small tank volume	Suitable for medium and small tank volume
Temperature resistance	Very good	Bad when using PP/PE	Bad	Very good
Pressure resistance	Good	Average	Bad	Good
Chemical resistance (hot oil)	Good	Limited with PP/PE	Limited with PP/PE	Good
Geometry	High costs with complex geometry	Complex external geometry possible	Complex external geometry possible	Complex external geometry possible
Cleanliness	Difficult to clean	Difficult to clean	Difficult to clean	Clean tank without additional cleaning
Costs	Surcharges if functions must be integrated	Integration of functions (e.g. filter housing) very difficult; high costs with the use of PA	Integration of functions (e.g. filter housing) very difficult	Easy integration of functions (e.g. filter housing) without additional costs

## Special features of the new production technology at ARGO-HYTOS

The injection molding technology, which is applied at ARGO-HYTOS, has established itself as one of the most important plastic processing methods. The process allows complex geometries at low manufacturing costs. Functions such as e.g. filter housing can be integrated without additional costs. Also the very good temperature resistance and the cleanliness of the tank (no additional cleaning required) are decisive criteria in the hydraulics for technology and procurement.





ARGO-HYTOS has manufactured injection molded tanks for numerous applications in mobile hydraulics, in which several functions are integrated such as e.g. a return filter. The ARGO-HYTOS tank solutions allow maximum freedom in design, which in turn means that also scarce space can optimally be used. In addition to the filter housing and filling strainer, also an oil level indicator can be integrated in the tank. Another positive aspect are the so-called "quick-connect ports", for whose assembly no tools are needed. The connectors are simply plugged into the corresponding tank connectors and fixed by a locking clip.



## Positive aspects of the functional integration

- 1 Filter housing can be integrated in the tank
- 2 Filling strainer can be integrated in the tank
- 3 Integrated oil level indicator
- 4 Ventilating filter with
- rollover protection valve 5 Quick-connect ports
- 6 Sensor connections
- 7 Oil drain plug
- 8 Baffle



**Richard Jenkner,** Dipl.-Ing. (FH) Head of International Product Management

"Our tank solutions allow maximum freedom in design, which in turn means that also scarce space can optimally be used."

## Overview

## Advantages of the injection molded ARGO-HYTOS tanks:

- Installation of a complete module into the machine
- > External return filter is no longer needed by integration in the tank
- > Easy filter element service / exchange
- Very clean tank module by injection molding technology and contactless welding methods
- > High mechanical strength and thermal stability through the use of polyamide
- High cost savings

Complex geometries at low manufacturing costs

# Cleaning an Excavator with OPS 550





OPS

The standstill of a machine can be expensive. For this reason, operators are very interested in a maximum availability of their equipment. So that a machine will pay for itself, it is sometimes however operated at the limit or beyond. This in turn provokes wear and damage which may cause a standstill. Cleaning of the oil with the OPS is a fast and cost-efficient means to eliminate traces of contamination and wear.

An excavator suffered from a defect at the tank cover due to its age and the conditions of use. Through torn bolts and a leaky closure, water could get into the oil tank. When the defect was noticed, large amounts of water had already been in the oil. By further operation of the machine, the water spread to the farthest pipe bends of the hydraulics and the machine shut down. Then a service company was commissioned with the oil change. However, this was not a solution to this problem, since large amounts of undissolved water remain in water nests as bends, hoses etc. Here the water collects and can only be removed or purged via circulation of the hydraulic circuit with a water-absorbing medium. Since the oil used had however reached its maximum water absorption capacity at an early stage, the water nests could not be removed completely, not even by rinsing.

After commissioning of the filled with fresh oil excavator, after only a short time the same situation presented itself as before the oil change.

The time spent on emptying, flushing and refilling the excavator added up to 2 man-days.

Looking at the total effort, this exceeds the costs of the fresh oil significantly:

- 1. The excavator could not be moved for two days, resulting in an economic loss.
- 2. The oil was drained and had to be disposed of as hazardous waste.
- 3. New oil had to be ordered and filled in.
- 4. The service employee could not carry out another task at that time since he was constantly engaged in the cleaning of the excavator.
- 5. The competent machine operator had to perform other tasks or take a vacation to cause no further costs.

For a more efficient solution, the ARGO-HYTOS service team was made use of. They utilized the OPS 550 (Oil Purification System), to clean off the oil professionally and to remove water, dirt and air in one and the same operation.

The oil content of the excavator amounts to approx. 300 – 400 liters in the complete system. The OPS was put into operation with the following settings:

Flow rate	30 l/min
Pressure	- 0.75 bar
Temperature	50°C

These settings are only once made by the operator. Then the device operates completely automatically.





Installation of the device

The tank could be reached only by means of a an auxiliary hydraulic lift due to the positioning and height of the excavator.

By direct connection of the OPS to the excavator, the hydraulics could continously be operated during the cleaning process. Since the oil is dried well below the saturation point, it is able to absorb water again. This allows to release the supports, jibs etc. by movement from water, which is pumped into the tank and cleaned off by the OPS.

During this application, the hydraulic system was completely flushed and operated for three times. By removal of the water and the air, the response of the hydraulic was more direct and softer.

The whole deployment took nine hours. Then the oil was clean again and the machine was able to pursue its actual work. As the process is fully automated and the OPS systems monitors itself, the mechanic could perform other work during the cleaning process.

## Summary

The application example shows that the OPS systems are an easy-to-use and effective solution for cleaning and treating fluids. The OPS systems offer an alternative to the traditional oil change and help to save costs for expensive oil changes or downtime. The experts of our ARGO-HYTOS service team gladly support you in selecting the right equipment and calculating your cost savings.



Data evaluation

www.argo-hytos.com Subject to change · April 2016



**Tobias Köhler,** Head of Fluid Management

"For a more efficient solution, the ARGO-HYTOS service team was made use of."

# **Industry 4.0**



**Dr. Marcus Fischer,** COO ARGO-HYTOS Group

"Predictive maintenance is an important component of Industry 4.0. Since 2008 we have developed customized solutions for condition monitoring of fluid power systems."



**Roman C. Krähling,** Head of Condition Monitoring

"In terms of technology and application knowledge, German companies such as ARGO-HYTOS set standards ."

Condition Monitoring is increasingly gaining importance due to steadily growing demands on machine availability and consideration of total costs (TCO). Industry 4.0 opens new application possibilities by stronger integration of sensors in machines and plants.

"Predictive maintenance is an important component of Industry 4.0", states Dr. Marcus Fischer, technical director of ARGO-HYTOS GmbH, Kraichtal-Menzingen. "Since 2008 we have developed customized solutions for condition monitoring of fluid power systems. By using our measurement systems, our customers are able to implement predictive maintenance concepts and to reduce the operational costs of machines effectively." This solution is supported by the fact that maintenance intervals can be defined depending on the machine or system, in order to reduce downtime. Dr. Fischer: "The additionally necessary use of hardware quickly pays for itself during the operation time of the system."

## Panama Canal: Application of sensors in canal lockage systems

"In terms of technology and application knowledge, German companies such as ARGO-HYTOS set standards ", says Roman Cecil Krähling, Condition Monitoring & Electronics manager. "Here, experience and investment in new technology are paying off". So, the new sensors developed by ARGO-HYTOS and the intelligent algorithms would allow customers to safely monitor the oil aging and wear of components. This allows them to detect problems at an early stage before they cause damage or a standstill. Krähling: "Our sensors have proved their worth in a variety of applications, from remote monitoring of a harvester through the oil condition monitoring in container terminals, to the complete hydraulic system in the canal lockage of the Panama Canal. Customers benefit not only from a significant expansion of oil change intervals but also from a better planning and measurability of service measures."

The aim is to provide the customer the optimal solution, without having to overcome costly barriers of communication infrastructure.

But to maximize the benefits for the customer, a simpler integration of measurement technology and standardized data processing is necessary. "As part of the Industry 4.0 initiative, we are working closely with the VDMA to create the necessary basics to this end", emphasizes Dr. Fischer. "The aim is to provide the customer the optimal solution, without having to overcome costly barriers of communication infrastructure". Predictive maintenance is also supported by the fact that in connection with the monitoring of entire plant parks, new business models may be created, both for plant operators as well as for service providers.



# Laser Cube 4.0 @ ARGO-HYTOS





Laser Cube 4.0

Successful machine manufacturers set trends and are developing dynamically. They specify the applied technology exactly according to the needs of the respective machine. This approach requires economical, customized solutions. In mobile hydraulics, annual purchase quantities of a few thousand pieces for highly integrated hydraulic, filtration and tank solutions are the rule.

ARGO-HYTOS has recognized this trend and has followed the concept of "ZERO SET-UP TIME" for several years. Through the use of networked components, "production facilities 4.0" are developed in our own plant engineering. Such as the Laser Cube 4.0 which has been put into operation at the factory in Kraichtal / Germany in December 2015.

The Laser Cube 4.0 has been optimized for flexibility and cost reduction in the manufacture of highly integrated plastic system and plastic tank solutions.

The flexible configuration of the system consists of interconnected core components which communicate with each other partly directly and partly via a machine controller. The on a moderate industrial robot mounted laser head can move freely in space and thereby weld even complex geometries in different welding levels. The sophisticated laser optics allows both the laser transmitted light welding as well as the guasi-simultaneous welding of plastic parts, sequentially in one welding operation. An in the plant control system integrated online monitoring and control of temperature in the melt ensures optimum welding results at maximum welding speed. The system further comprises an integrated device magazine. Via a lift system, the component-specific devices are automatically moved into the loading position and also automatically contacted, pneumatically as well as electrically. The operator selects the component to be manufactured by confirmation on a touch panel and the machine is changing over fully automatically within a few seconds.

The networking of the components, the targeted tuning of the system functions and the user-oriented interface concept make it possible to economically realize even small quantities of customized highly integrated plastic system and plastic tank solutions at a maximum in flexibility in quantity and independent of component geometries.

**Jörg Stech,** General Manager Operations & Administration

"The Laser Cube 4.0 has been optimized for flexibility and cost reduction in the manufacture of highly integrated plastic system and plastic tank solutions."

Laser Cube 4.0 @ ARGO-HYTOS, when "customized" makes the manufacturing process exciting

# Who is... Bob?



Robert Buchanan, General Manager from ARGO-HYTOS Great Britain, celebrates this year his 20<sup>th</sup> anniversary at ARGO-HYTOS. CONGRATULATION, Bob.

We would like to use this opportunity to introduce Bob a bit more and ask him a few questions:

## Bob, can you tell us the greatest challenge during the last 20 year at ARGO-HYTOS?

This is two fold, seeing the company through the major recession in 2008/2009 & the establishment / development of our power pack and special manifold production center.

What was the most incredible moment in your life? Birth of my daughter.

## Which dream has not yet been fulfilled?

Having the company in a purpose built facility.

What do you like to do outside of the business?

I enjoy hiking and running on the fells of the UK...good for body and mind.

#### What is your motto in life?

I have 2: Work hard, play hard. Nothing ventured, nothing gained.

Thank you very much Bob, have a great time, fun and enjoy life the most – in your private life as well as at work.



# Our Participation in Exhibitions 2016 at a Glance



**bauma** 11.04.-17.04.2016 Munich, Germany







Munich, Germany IFPEX

12.04.-14.04.2016 Birmingham, Great Britain

Northern Industry 25.05.-26.05.2016 Oulu, Finland









MSV Brno 03.10.-07.10.2016 Brno, Czech Republic

**PTC Asia** 01.11.-04.11.2016 Shanghai, China

**eima** 09.11.-13.11.2016 Bologna, Italy

**bauma China** 22.11.-25.11.2016 Shanghai, China

Come to visit us at our exhibition booths. We are looking forward to seeing you.

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Wind Energy 27.09.-30.09.2016 Hamburg, Germany





- Valves Explosion Proof Valves Solenoid Systems System Solutions Manifolds
- Power Packs Hydraulic Drives Filtration Fluid Management Sensors Measurement





## Fluid power technology for success

Innovations and intelligent system solutions combined with flexibility and productivity – ARGO-HYTOS sets new standards in all areas of fluid power technology.

## We make your products better. Worldwide.

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