

# WORLD TELEVISION

Johnson Matthey

Analyst and Investor Day 2014

## **Johnson Matthey - Analyst and Investor Day 2014**

### **Johnson Matthey**

**Neil Carson, Chief Executive**

**Geoff Otterman, Division Director, Process Technologies**

**Iain Martin, Technology Director, Process Technologies**

**Henry Liu, Country Director, China**

**Don Roche, Director, Oil and Gas**

### **QUESTIONS FROM**

**Doug Harned, Bernstein**

**Paul Walsh, Morgan Stanley**

**Thomas Gilbert, UBS**

**Martin Dunwoodie, Deutsche Bank**

**Christian Schlimm, Allianz Global Investors**

**Simon Fickling, Exane BNP Paribas**

**Andrew Stott, Bank of America / Merrill Lynch**

**Adam Collins, Liberum**

**Charles Pick, Numis**

**Martin Evans, JP Morgan**

**Peter Cartwright, Fiske**

**Geoff Haire, HSBC**

**Rakesh Patel, Goldman Sachs**

***Introduction and Welcome***

**Neil Carson, Chief Executive**

Before we start on the business of the day, just to comment, I'm sure you have seen a couple of announcements this morning; the IMS, which many of you will have already debated with Robert and the one about succession. So in case there was somebody in the room that didn't know about the succession plans here, I've decided that the time is right now to stand down from Johnson Matthey, I'll be standing down on the 5th of June after the announcement of our full year results for this current year. And I'm absolutely delighted to also announce that Robert MacLeod will take over from me as my successor.

I think, you know, that this job that I've had at Johnson Matthey has been a massive privilege to work as CEO of this company for the last ten years. And one of the duties of the role, maybe one of the difficult duties actually is to then decide when it's best to stand down and hand over to the successors and to work with the Board as a Chief Executive in order to make that a smooth transition. So that's where we're at and I'm sure the company will go on and continue to thrive under Robert's guidance.

So with that, let's get back to the business of the day. So we have a full programme here for you and I'm going to leave Geoff who runs this division to run through it and introduce to you the presenters. But we also have in the room the full Process Technology management team and they are there for you to seek out in coffee breaks and at other times and ask any questions you like about this business.

You'll know that starting in 2013 we started to reveal more of the metrics about this business, the reason was that we thought that you'd be interested because we also think that it's an exciting and growing business. So you've got in this room a large management team of managers and they would all very much appreciate answering your questions, or debating the future of their particular part of PT as we go through.

So a fullish afternoon, I am going to be blending into the background for the rest of the day until the very end and then I'm hoping the some of you maybe will join us for some drinks and a dinner around the corner.

So with that I will leave you and hand over to Geoff, thank you very much.

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***Opportunities in Process Technologies***

**Geoff Otterman, Division Director, Process Technologies**

Well thank you Neil, it's good to hear that - Neil says that you're in for a fullish afternoon, so I'm not sure which meaning of the word he meant with that. But it's also good to talk about PT on a slow news day within Johnson Matthey, so hopefully we can get you interested in PT, keep your interest even after you've had a bit of lunch.

So anyway, welcome to the Investor Day where we're going to feature Process Technologies, a quick introduction from me, Geoff Otterman, I've been with Johnson Matthey 24 plus years, before that I work at KPMG for a bit. My time with Johnson

## Johnson Matthey - Analyst and Investor Day 2014

Matthey has largely been in the finance area and I came up through the finance ranks, a lot of my experience was in the precious metals area as well. And I've been running the Process Technology division for about the last two and a half, three years.

A quick run through the agenda today, so I'll talk about some of the opportunities we have, talk to you about some of the broad markets that we're in, I'll then pass it over to Iain Martin who is my Technology Director and he'll talk about some of the technology that we have across the division, as well as focus on some of the opportunities we have in the chemicals market.

I'll turn it over to Henry Liu, who is our China Country Manager and he also runs our Substitute Natural Gas Group. And Henry will talk to you a lot about that.

Then wrapping it up will be Don Roche, who runs our Oil and Gas cluster of businesses, though Don's pretty new to Johnson Matthey and he'll tell you about the opportunities there as well. So that's the team that will be speaking.

I did want to quickly introduce the members of my team who are in the audience, so hopefully I don't skip any. But in the Chemicals area I have Paul Armitage, if Paul you wouldn't mind standing. Antoine Bordet, Jane Butcher, Andy Hurst, Mohammed Khan, Graeme McGregor, sorry those last three are in our Oil and Gas business, I should have mentioned that, sorry about that. And my divisional staff, I have Joe Stevenson, Business Development Director, Simon Slattery, my Finance Director and Andrew Heavers who works with Joe in Business Development. So that's the PT team.

So I encourage you to engage with them on breaks or at dinner just to fill in the blanks of the things that we're maybe not telling you.

Anyway, the aims today - what are we looking to accomplish, well really to make sure that you leave here with a lot fuller understanding of what this division does. We're proud that it's being highlighted more and are excited to tell you about some of the opportunities that we have. So I want to focus some time on the technology we have and how that technology and the knowhow we have is a key differentiator for us in the markets. Finally, we'll talk about some of the specific opportunities that we have for growth; so growth that will take us beyond kind of GDP, or standard growth.

And looking at all of that we're hoping that we can - we're targeting to achieve something like 10% top line growth over the next six or seven years, so through to the end of the decade.

Just quickly, a quick description of PT, so I know we're focusing a little bit more on it; we thought it was worth just a quick talk about it. But again I encourage you to talk to others about it.

So what do we do? Well, it says there in the by-line there that we have technical strengths and knowhow and we use those really to help us develop flowsheets, to develop catalysts that are then deployed into the petrochemicals and oil markets.

## Johnson Matthey - Analyst and Investor Day 2014

So what's key to us? Well, it's key to us to work closely with plants, feedstock and capital costs are the most expensive parts of our customers' plants and we work with them to ensure an efficient transformation of the feedstock to a more valuable end product.

So catalysts - well catalysts might be a fixed bed catalyst and the loading of a fixed bed catalyst might be a couple of hundred kilos, or it might be up to several tonnes of material that could be loaded in a fixed bed, and those would be pellets, it might be a powder, or a specialised shape to optimise the reaction within the vessel.

The other type of catalyst we sell would be a powdered catalyst and that powdered catalyst can be dosed into a fluidised bed reactor, so it's a completely different technology. So we're pleased that we have both of those.

The composition of the catalyst could be copper, you might have zinc, you might have some chrome, some nickel, it might have some precious metals in it; so some platinum, some palladium, maybe some ruthenium, and it might be built on a substrate like on a zeolite, or alumina, or silica. So a pretty broad range of materials that we can deploy within our catalyst areas.

When we say process, what we're really talking about is an understanding of flowsheets and the licensing of the flowsheets. And key with those is really to make sure that we have a good interaction of our flowsheet expertise, combined with what we do on the catalyst part of the business. So R&D is key there, the knowhow that we have with the people is quite integral to our product offering.

So that's a bit of PT and what do we do. I'd like to get into how PT has really come about. So a dozen years ago the business that we had was probably a couple of million pounds worth of sales, buried into a product line in another business or two. And Johnson Matthey decided that we wanted to become more of a catalysts expert, we wanted to get more into this.

So the first thing we did was we bought ICI's catalyst business from them, we did that in 2002. And what did that bring to us? Well they had expertise in some specialised markets in which we did not participate, so methanol, ammonia, some things in petrochemicals, in hydrogen were the key markets in which they participated. And they also brought a whole new range of materials, so the base metals that I talked about earlier, so the copper, the chrome, the nickel were really their bread and butter.

The next business we purchased was the Davy Process Technology business that was in 2006. And the core of their expertise really is the process design, so it's the flowsheet expertise; it goes back to the interaction of the catalyst in a reactor with the technology. And we really like that business because of the synergies we had with the flowsheet design and the catalyst expertise that we bought with the ICI Group.

2010 we bought what's called the Intercat business. Intercat really was the first business that we bought that thrust us into the heart of the refineries, in oil refineries. And why is it important? Well - or why was it interesting to us? Well, their products, a lot of their products that they sell have links into environmental controls, which fits well

## Johnson Matthey - Analyst and Investor Day 2014

with us and they also have products that help enable refineries to run more profitably, so we like both of those drivers.

The last key acquisition in the portfolio was one we did about a year ago called Formox. And Formox has technology in catalyst to make formaldehyde. So again one of the reasons we like them is that they have a good combination of the flowsheet expertise that we like to have and the catalyst. And I know I've said that a number of times, but that interaction within a technology is the real sweet spot for us and it's a place where we can differentiate ourselves in the marketplace.

So that's kind of the four big building blocks that have happened over the last dozen years. But we had more ambition than that. So we tried to build on some of the things that we brought over from the acquisitions. And the things we like about them, they're strong in their markets; we liked the people that they had in there, so it gives us the opportunity to differentiate. And in each of those businesses we found were hungry for investment.

So just to give you a feel for some of the things we've done since we acquired these businesses, I mentioned the people, yes we're looking for hungry people who are keen to get out in the marketplace and learn about the markets, learn about the technology and helps us deploy the appropriate technology with customers.

Over that time we spent about £200m on R&D and again a lot of it is on flowsheet, a lot of it's on the catalyst. Capital spending, well what we try to do is take a very long term view of our capital, so we invest so that when the business comes around we're ready to take advantage of it and we spent about £300m in capex over that period of time. So that's given us new plants, new capability and it's gotten us out into different areas of the world. So all in Johnson Matthey has invested about £1bn into this division over the last dozen years.

So that's been the evolution of PT, so what do we look like now? Well we've about 2300 employees in the division, about 10% of them work in the R&D area, about half the people who work for us are based in the UK, which is the traditional hub for - the hub for the ICI business we bought, as well as the Davy business that came across; so a prominent presence there. Over the last several years the division has enjoyed about 15% top line growth, even 10% if you strip out the Intercat acquisition.

Sales are spread really pretty nicely across the globe, we have four key regions where the sales are about 20 - 25% of our total division sales, so that's in China, the Middle East and the rest of Asia is another region, Europe and then North America. So we think a really good geographic split of the business. And you'll see on the far right where we're splitting the business now into Oil and Gas and the Chemical sector and we'll give you a bit more information on that.

If you look at us on the map - well we're spread across the globe like you might expect for a company like ours, so technology centres, manufacturing plants, and sales and service offices spread all over the place. If you looked at this a year from now or so, you'd also see that we have manufacturing plants in Shanghai and we're also building one in Brazil right now. So those are two important growth areas for us.

## Johnson Matthey - Analyst and Investor Day 2014

So that's kind of what we are and a little bit of where we do it. Next I'd like to talk about some of the strategy that we have and give a little colour to this split of Oil and Gas and Chemicals.

So first off in the top left there in the Chemicals area, what are we really trying to do? Well again it's investment in the flowsheet understanding, it's investments in catalysts and making sure that we understand what happens in customers' plants so that we can optimise the operation of their plants.

In the Oil and Gas area, well we have narrow positions there but we're really looking to take what we have and see what we can do with it. An example of that is with the Intercat acquisition, the Intercat acquisition brought two things into us, it brought fluidised bed expertise and it brought zeolites expertise and we're looking for ways that we can take those two and spread them out beyond just that one business.

Also, where some of the keys for us are growing - well we're going to invest internally and we also look to invest externally. On the Internal side we're going to look to put a big commitment in R&D, presently we spend around £30m sterling a year on R&D and that represents about 5% of our sales and we look for that ratio to continue into the future.

Capital spending is going to be a key feature as we go forward, over the next four to six years, it depends on how things go, we're looking to spend around £400m, mostly on new capacity in different parts of the world. Now that's a significant amount, to put that in context a bit, that's more than double our run rate for the last couple of years. So we're looking to step up our investments there.

Return on invested capital, well we're presently at about 16% within the division. The Johnson Matthey Group target is 20% and we believe we can get there over the next kind of five or seven years. So that's still a target despite pretty significant investment.

Some of the external things we look at, well we work with a number of external partners and why do we do that? Well, the key reason for us to do it is that it helps us to get technology taken up more quickly. So some of the key partners we work with are Dow, we work with BP, Air Products, and Eastman are just an example of some of the companies that we work with and again they really help us to get technology out in the marketplace more quickly.

We're also going to look to acquisitions as we go forward, and we would look to essentially replicate what we've been able to do before, in terms of the quality companies that we buy in and we want to make sure that they have a good technology presence and things where we can continue to invest and have a unique position in the marketplace.

We can start to talk about this split between Chemicals and Oil and Gas. Well why do we do this? Well we thought it made sense to break our businesses into more market facing groups in which they face. So in the chemicals area there are three markets that are included in that and that's Syngas, Petrochemicals and then we've combined Oleo

## Johnson Matthey - Analyst and Investor Day 2014

Chemical and Biochemical and represents again 60% of our sales. The margins in these businesses taken as a whole are about 20% and I'll give people a minute to write that one down.

So another point that I'd want to just note here is that you don't see the Davy business as a separate carve out of this, and why is that? Well, the reason is that the technology, the flowsheet expertise is a key feature in all three of the markets, so between the Davy technology we have, the flowsheet expertise, or the Formox, so the acquisition we did there; it's really spread among those three market facing groups. So we look at it as an integral part of our offering into the marketplace.

On the Oil and Gas side we've clustered things here for you into refineries, gas processing, and diagnostic services, again that's about 40% of the sales and you can see the split of those.

So for most of the markets in which we participate we have a leadership position, so kind of one, two in most of our chosen - pretty narrow markets.

Next we'll talk a little bit more about the Chemicals area, now this is a simplified flowsheet and it just highlights the areas in which Johnson Matthey participates. I'm not going to spend a lot of time, Iain Martin, the technology guy will spend a little bit more time and I'm sure he can spend time at the bar with you as well on it. But what this attempts to do is really segment what we do into the Syngas, Petrochems and Oleo/Bio areas.

But what the flowsheet then shows is that Johnson Matthey can take a diverse range of feedstock, so it's oil, it can be bio-feed, natural gas and then convert it to a number of building blocks, chemical and intermediates that the end customer will then convert to products that they'd sell in the marketplace. So you'll see this slide a little later this afternoon.

So the flowsheet that I showed you was really a point of departure, just highlighting what we do today, so how do we grow beyond that really? Well, we look for a unique space in the marketplace where we think we can have an advantage with the flowsheet design we have, or maybe we can come up with the unique catalyst in the area. The goal is to find new space, an example of that - Iain Martin again will talk about, but it's an area with oxo alcohols, a big market - this has been a big market for us, especially in China recently.

We've changed, or modified our technology so that we can take what was essentially a waste product and we've been able to take that product and convert it to a more value added product for the customer. So it's really just a good example of how we'll stay on top of what's going on in the marketplace and we're quick to respond and then redeploy a different technology.

Again, what we do - the right hand block is really try to find that intersection of flowsheet expertise, catalyst expertise, build the knowhow of our people around that for something unique we can offer in the market.

## Johnson Matthey - Analyst and Investor Day 2014

Just a little bit of colour on the Oil and Gas area, highlighting here that we have four product areas, product/market - refineries hydrogen - well that's a bit self-explanatory, Don will talk a lot more about it. But it's hydrogen that would be used in the refineries for purification, maybe of sulphur; it can be also used for cracking long chain molecules into more value added smaller ones.

The additives business, we touched on that a little bit, that's the Formox\* business (\*Should be Intercat not Formox). These are catalysts that are dosed continuously into FCC units in refineries and they help customers change their product mix to help with their profitability, but it also gives them tools to reduce their emissions of SOx and NOx. So gas purification important for us - we have products that remove sulphur, mercury, so it does polishing of those for gas coming out of the ground before it goes into the pipelines and there are other uses for it as well.

And diagnostic services, well this is part of our prime offering within our Tracerco business where we're offering inspection, diagnostics services from exploration all the way through to - up to the wellhead and then what's going on within pipelines or within reactors.

So what about the markets, if you look at this from a demand perspective? Well, in the Chemicals, Oil and Gas area you look at the end products and you can see demand rising over the next several years of 1 to 3%. Within that 1 to 3% there are some markets in there that are a little more interesting, methanol should show some better growth, SNG which Henry will talk about, so that's substitute natural gas should be more interesting. Looking on the Oil side, I've already talked about hydrogen and about additives a bit.

And even in the markets where there's not going to be significant growth some of the key drivers in the marketplace, like demand for cleaner fuels, environmental pressures, profitability pressures in businesses, a lot of those issues that businesses might have can have flowsheet or catalytic solutions associated with them. So market drivers really feel like they're in our favour right now.

Well if you've been to one of these before you probably would have seen this, or picked up something from Johnson Matthey, so we think it's a good graphic for us to use. So this is for all of Johnson Matthey and we've highlighted here the ones that we think have the best opportunities for PT.

So just a couple of things about them - there's some market demands, the imperative for process changes and regulatory compliance issues, again all those things are built in here. And these changes that are going on in the marketplace we do see as giving us good opportunities for long term growth.

Next, I'd like to talk about some of the bigger opportunities we have. So the things I talked to you about already, some of the standard growth in the markets that we would see - we would see that giving us top line growth of something like another £200m. So take us from somewhere just south of £600m this year to £800m, so again just on the normal kind of growth.

## Johnson Matthey - Analyst and Investor Day 2014

But we see four big opportunities that can give us kind of that step out opportunity and again these are things that are going on in the marketplace now. So we're pretty confident that a lot of what we're talking about is going to happen because we've pretty good visibility in the marketplace.

So four areas I want to talk about is shale gas in the US, I already had some questions at lunch over that, so I'll try not to give the answer away. Global demand for fuels - that's increased transportation fuels and some of the drivers around making those. The next is coal to chemicals and this is a China phenomenon that we'll talk about. And finally we'll talk about the increasing pressure for companies to run their existing assets harder and then to monitor what's going on inside them.

If I can I'd like to first talk about shale gas. So you've all heard about it, it's come about in the last several years to us what does it really mean? Well to us it really means - it's the opportunity for the petrochemicals industry in the US to develop because of the availability of cheap feedstock. So you can read the market studies, I came across one recently that the petrochemicals market - there will be investments of 70 to 100 billion dollars over the next 15, 20 years. So that's the part of shale gas that's interesting to us, it's the development of the petrochemicals industry.

And we see changes happening already, we see dormant methanol plants being moved from South America up to the Gulf Coast. We see companies who are interested in building new methanol plants, so we talked to a number of them. And we see companies interested in building new ammonia plants in the US. So those are things that we haven't seen there in quite a long time. So on ammonia, on that extra growth that we see in ammonia and in methanol we think we can benefit from.

But one of the big opportunities that we do see is in gas to liquids and gas to liquids has been around for a while, Johnson Matthey's been working on it, well for quite a while as well. Right now the economics are really compelling; you can take a cheap natural gas feedstock and convert it to a higher value diesel end product. So that's essentially the business model and it's a differential in prices, the feedstock versus the output that can make the economics work.

We've had discussions with companies now, the economics seem to work and we're working - the work that we do with companies is we're really trying to make sure that they understand the issues of running plants and we're hoping we can get them to de-risk their investments by dealing with a company like ours.

So the opportunity for us is both we would expect to get licensing revenue on flowsheet design, but the big win longer term for us is when we start selling catalysts. So if we get a number of these plants going, and we have some licensing, when you get the catalysts, when we've got refill business that's the part where we think that can add another - something like £75m to our top line by the end of the decade. And again, it's engineering, process revenues for the next several years and then the catalyst revenue would take off.

But this does rely on several companies making big investments. These plants can be one, two, three billion dollar plants that they'd be looking to put in. But if companies are

## Johnson Matthey - Analyst and Investor Day 2014

ready to make the investments, if we can help them we'll be ready to both work with them on the flowsheet and build plants to make their catalysts.

Next, just to talk about transportation fuels, I talked about a lot of the drivers already for improved emission standards, for feedstock that has more sulphur in it, longer chain molecules. All those things really play well into the products that we sell, both the additives, the hydrogen business, as well as some of the products that we sell for exploration. So again, a good business for us, we see this giving us opportunity for an additional kind of £50m on the top line.

Next, coal to chemicals, a China phenomenon, this is where China is trying to monetise its coal reserves, reduce the dependency on imports for natural gas, cleaner air in places like Beijing and Shanghai if you've been there. And this is something that's already happening, so there's already coal being gasified and converted to methanol, or then taken downstream and converted to olefins for plastics. But the big win for Johnson Matthey is if we take a gasified coal in the coal regions in China and then we can convert that to an SNG, so a substitute natural gas. And we have flowsheet expertise that we can license to them and we have catalysts to sell to enable that.

So this is happening now, so there's already a plant that's running now where we've already licensed and customers are building more of these plants. And we see this continuing to grow for the next several years. So by the end of the decade with licences, with catalysts sales on new plants and with refill, which is key to our business, we see this adding £100m to the top line. And Henry Liu will talk a little bit more about this.

And finally we've titled this Asset Performance and Integrity. And this is really us looking at customers' existing assets and how can we help them make them either more profitable, in which case we can sell them what are called revamps, we might sell them a different - they might have a different reactor, they might want to make a different end product, they might have utilities cost issues. So we'll work with them on improving the efficiency, or the output of their existing plants.

The other part we talked about is inspection of existing assets and if you look here we have this banana coloured tool, which - I'm not allowed to say either of those words, but we have this new inspection device, it's come from our Tracerco business to inspect subsea piping, so it's pretty exciting and a new invention that our business has come up with and we see it having really good growth prospects over the next couple of years.

So if you take all those things into consideration the top line growth there, if you add that up that comes to about £280m and that assumes that we keep our existing market shares in those areas, so it's not the total market, so it's what we think we can get.

Instead of the £280m what we've done is we've pencilled in £200m of top line growth for our businesses, so that's what enables us to get - you know from £600m to £800m on the more ordinary growth and then you tag on these four and that takes us up to a billion in revenue by the end of the decade.

## Johnson Matthey - Analyst and Investor Day 2014

The next couple of slides - I just wanted to talk through - you know why do customers come to us? Why do they want to build a new plant with us? Why do they buy catalysts from us on a first charge and even refill? And then finally, what do we do to make sure that we keep business even in emerging markets, which is a new challenge to us?

Why do they licence technology from us for a new plant? Well, I think the biggest thing is if they do that they're going to have the confidence that the plant is going to work and that the economics of it are going to either meet or exceed their expectations. So again these are very expensive plants, hundreds of millions to maybe a couple of billion dollars, so what they pay us give them that confidence that the plant is going to work. So it helps them de-risk their investment.

So what about after the plant is running? So they get our technology in it, they get our catalyst, the end of life for a catalyst charge might be two to four years away, why do they buy it from us again? Well, a lot of the plant operators - if their plant is working they're really loathed to change. You'll see - Iain's going to run through an example a little bit later that shows the how catalyst cost to a business is very small relative to the feedstock and the utilities costs that goes in it. So if they have something that works that plays well into our hands that's important for our business, about 70% of the business that we have is resale business, so it's a key part of us, a key part of what we do.

So we can't sit around - that doesn't mean we can be lax about product development, the imperative for us is to have the intimate relationship with the customers, to know what's going on with them, to understand what's going on in their plant, what new products they might want, how they might want the catalyst tweaked. So that's how we maintain a high share of our business is by engaging with our customers on a regular basis.

So what about in emerging markets, what challenges do we find there. Well, in emerging markets we see certainly on the first fill, you know if a customer is building a new plant, if they're building a new methanol plant for example in China and they're taking Johnson Matthey's catalyst we really see the same economic drivers in China as we're accustomed to seeing in the Western world. So they look for the same return on investment metrics that we look at, the same safety standards that we would make sure were in there, the same operability standards. So fundamentally we don't see that market as significantly different.

Now where we do have to make sure we're on the ball is on the replacement business, again that's an area where we have to make sure that we're working closely with them, that we understand how important the cost is to the catalyst. If a customer for example has interrupted feedstock how does that play into the economics of the plant and then the design of the catalyst. We're trying to fend that off, one of the ways we fend that off is we're going to be building a new catalyst plant in China, so that will take away any cost issue. And we're always looking to see how we can simplify our processes and make our catalysts more cheaply.

So some of the takeaways here as I wrap up here. So we're strong in the markets in which we participate, so we try to be one or two in the markets is how we define them.

## Johnson Matthey - Analyst and Investor Day 2014

And how do we do that? Well, by ensuring that the products we do sell are the leading technology. And it requires us to put in a lot of R&D, a lot of technical service, so there's a lot of technology and a lot of knowhow that goes around that.

On the market side, well it seems that a number of things are coming together now that should play well for us in the long term. I talked about some of the environmental pressures, pressures on refineries to run more profitability. So changes in feedstock. All those things play really well into our space.

Margins, well presently 20% in Chemicals and mid teens in the Oil and Gas area. And we would expect those to continue, we'll certainly strive to increase them, but we would expect those to continue over the next several years.

Finally on the growth, well, we think it's possible for us to get double digit growth over the next ten years, I can give you a bit of a profile of how we think we can get that. If we think about some of the market we're in, if we look for example at methanol, you know we see good growth prospects there, so pretty steady growth from now through to the end of the decade. That said, it could be kind of lumpy at times. So you might get new plants coming on, or you might get a couple of bigger plants that need refill. So there could be some ups and downs, but the long term trend is up.

In substitute natural gas, selling some licences now, we sell some catalysts now; we see that really stepping up over the next two to three years. And then we have in our models that that will level out nearer the end of the decade. And we're saying that because we don't know how long this coal to chemicals push within China will last. So in our models we've assumed that that will kind of level off near the end of the decade.

Gas to liquids I talked a bit about that, some licencing over the next several years, but the big win for us is if we can sell catalysts, if we have multiple sales then we can sell catalysts. And there's significant revenue for that will be nearer the end of the decade.

Well what we see is more or less steady growth, we don't see any real big step changes in what we're doing now. So I think that's it from me. So good growth overall, try to tie in the technology and the catalysts where we can, we're trying to get ready for when the markets do develop.

So that's it I'm happy to take questions now and I guess logistically if you have a question wait for one of the ladies to bring a microphone to you and if you could introduce yourself and the company you work for.

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### **Questions and Answers**

#### **Paul Walsh, Morgan Stanley**

Just two questions from my side please. The first is to what extent delays in the ramp up of new North America ethylene capacity have been taken into consideration? I know there are the stated timelines, but my understanding is that much of that might well be delayed. The same thing really from coal to chemicals in China, we keep hearing from

## Johnson Matthey - Analyst and Investor Day 2014

the industrial gas companies that that's something that's been pushed out a little bit, just your thoughts on that?

And my second question, on the numbers, you've given aspirations for double digit top line growth and a return to target in line with the Group, which on my maths is suggesting, you know you're going to get margins up to sort of low 20s really from where we sit today and EBIT absolute could almost double in the next four to five years. I just wondered if that's kind of right in terms of what you're thinking, because that's what you back out from the comments around returns and growth? Thank you.

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### **Geoff Otterman, Division Director, Process Technologies**

I'd say four or five years is probably a bit optimistic for when we would look for EBIT to double, but certainly the end of the decade that would be a target area.

A couple of other things, ethylene we don't have a position in ethylene really, we don't have - it's not a catalytic - I don't think it's catalytic process, we don't have any flowsheet - it's not catalytic so we don't have anything in there. So projects being cancelled - that doesn't really matter to us in this space.

Coal to chemicals, well yeah we have seen a slowdown and the early indicator for us is the number of new licences that we sell. So that's definitely - we've seen it slow down in 2013. We're still seeing a lot of activity in the marketplace, a lot of projects approved, but they just have to go forward. So we're still bullish that it'll happen, it might a little later than we might have hoped, but we still see the market developing.

And the numbers, kind of the view I gave and Henry will talk about is really taking that slowdown this past year into consideration.

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### **Paul Walsh, Morgan Stanley**

Thank you.

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### **Thomas Gilbert, UBS**

Thank you very much. A lot more basic question, can you talk a bit about the stickiness of the revenue in this business in terms of when you win a project do you have the revenue for the physical life of the plant, or is this more a customer relationship - I mean I don't if you're in a business with Shell does that mean you can roll that out over all their platforms, or is it plant by plant, also what happens when the ownership of an asset changes, what does that mean to you? So just a couple of general comments.

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### **Geoff Otterman, Division Director, Process Technologies**

Well we like it to be sticky. I mean what we do see is that - I think it's 70% of our business is refill business, so it's repeat business that we would have with a customer. How sticky is it? We have - for example we have methanol customers that once a

technology is used in one of the plants they'll look to roll it out into different plants, so that can happen.

I don't - we don't see a lot of other - I don't think we see a lot of other examples where someone would have one plant, they do it here and then they roll it out to others. I'm trying to think. I think we see that maybe in some of the refineries business. But that rolling out to different plants, I don't think - that doesn't happen. But we do work awfully hard to make sure that once we get in we understand what's going with a customer and that we can be in the poll-position for repeat business.

And the answer is probably going to differ for some of the different technologies that we have, so some of the other guys might be able to shed some light on it later.

.....

**Martin Dunwoodie, Deutsche Bank**

Apologies this is another fairly basic question I think. If you sell the licence to a plant or an operator how much does that guarantee you're selling the catalyst as well, or do you see other people have the opportunity to sell the catalyst?

And then secondly, again, probably very ignorant, but are there obvious gaps in technology that you have in the division that you want to fill?

.....

**Geoff Otterman, Division Director, Process Technologies**

Okay - if we licence technology typically we would sell the catalyst in, we do have a good track record. some of the technology that we sell - we might put in a non-Johnson Matthey catalyst, but part of the service that the Davy Group gives is it does a lot of robust testing of the catalyst. So it's adding value to the customer. So again they - where it's a Davy licenced product, or flowsheet we have a very high success of repeat business.

So certainly in the short term, but long term for these plants could be 20, 30 years might be the lifetime of a plant, again that's an area where we have to maintain a good relationship and make sure that we're fending off any competition. Because after - a part of taking on - part of what happens when we license something is we're guaranteeing the plant operation and it has to have the catalyst that we recommend. So the customers will know that if they use someone else's catalysts that they're potentially changing the operation of the plant.

Gaps that we're looking to fill ...

.....

**Martin Dunwoodie, Deutsche Bank**

I'm guessing you don't want to answer that particularly.

.....

**Geoff Otterman, Division Director, Process Technologies**

## Johnson Matthey - Analyst and Investor Day 2014

Yeah, well what I would say - I guess I'd go back to some of the things - I was just talking about acquisitions. We're eager to get into adjacent technology areas and we'll look for those, we'll try to invent them, we'll look for - one of the things we've done in the past is we'll approach a company and look at a technology that maybe it hasn't invested in in a while and maybe we'll try to bring that in and refresh it. That's been a successful business model for us.

We might look to acquire a company - I mean part of the Formox business models is technology. So that was a really good acquisition for us, so that would have been a gap - that was a gap because it got us into fluidised bed technology, got us downstream from methanol. But it also was our first oxidation catalyst, so it's a different class of catalyst. It's good for us.

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### **Martin Dunwoodie, Deutsche Bank**

Okay, thanks.

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### **Christian Schlimm, Allianz Global Investors**

I have two questions, the first one is are you conducting any research on processes that consume CO<sub>2</sub> other than the existing establish urea process? And the second question is, what is your working assumption regarding competing technologies, because the chemical conversion is under a whole lot of - development work on the basis of enzymes, algae, wood cellulosic based chemistry. Take for example Butanediol where you sell licences, we get to C4 platform chemicals out of wood, how do you think will those new technologies impact your business?

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### **Geoff Otterman, Division Director, Process Technologies**

Well, I think that question is probably best answered by my technology director; I'll throw him under the bus here. I tell you what, can we hold that and we'll cover it when he gets up, I guess we have three presenters going through Chemicals, China and Oil and Gas - on the detail things we may push to later.

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### **Simon Fickling, Exane BNP Paribas**

On the Davy business, firstly just on housekeeping really, will that not be reported separately going forwards, is that now fully integrated for reporting purposes in the ...

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### **Geoff Otterman, Division Director, Process Technologies**

Correct, we do not plan to split it out any more.

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### **Simon Fickling, Exane BNP Paribas**

Okay, sure. And secondly on the Davy business, can you give us a bit more colour on the shape of how revenue comes in after contracts are awarded, because I know there's been four since the start of January, you said it comes in quite lumpily, but how that translates into revenues? Thanks.

.....

**Geoff Otterman, Division Director, Process Technologies**

I might get my chief accountant to go through that explanation, as it's a fun gymnastics when we're going through. But essentially the business will recognise - it gets revenue from a couple of sources. The licence income that it gets will be phased over the project time period; so from the time we sign something, and it could be two, three years, you know that period of time when we'd amortise that revenue into the P&L.

The other source of revenue that they get is for engineering services, so to take the customer's requirements, translate that into a basic engineering package. So we'll do engineering on that and we'll get a margin on that and we'll get revenue on that as it occurs. So I'm not sure - it's kind of a percentage on completion on the licence part and then they'd be as you go on the engineering and if we sell catalysts as well we'll get the margin on that when the catalyst has to be delivered.

.....

**Simon Fickling, Exane BNP Paribas**

Great and sorry one I did have as well on Davy, am I right in thinking your competition, the direct competition on the catalyst side they don't have this flowsheet type business? Could you talk a bit about your competition in that area? And perhaps a comment on why, if it is so beneficial to the catalyst business, the synergies that are operating there - why perhaps your competitors in chemical catalysts haven't sought to make the acquisition that you make a few years ago into the flowsheet licensing business?

.....

**Geoff Otterman, Division Director, Process Technologies**

Well we do have competition, it's very similar to ours, a good example of that is Haldor Topsoe the Danish company, a competitor of Johnson Matthey's in a number of areas and they do bring that flowsheet design expertise and the catalyst manufacturing to the party.

There is another company we deal with - a technology company, kind of a commercial partnership with a catalyst company, so they'll try to put something together. But it's not a joint ownership position; it's more of a commercial agreement. So we do see that level of competition in the marketplace.

.....

**Simon Fickling, Exane BNP Paribas**

Okay, thanks.

.....

**Andrew Stott, Bank of America / Merrill Lynch**

## Johnson Matthey - Analyst and Investor Day 2014

Just coming back to your 10% target, or your double digit sorry target, the building blocks for that as I understood it are underlying growth from refill of 5 or 6% looking at your slide 19. The next leg up is capex related I guess. Is there anything else in that equation, are you banking on market share gain, or acquisitions within that target?

.....

### **Geoff Otterman, Division Director, Process Technologies**

No, our key assumption is that we maintain market shares, no big gains, no big losses - you know a bit of ups and downs, and no acquisitions in there.

.....

### **Adam Collins, Liberum**

You talked about the fact that refill is important, 70% of sales, and I think you mentioned that the refill rate is between two and four years, give or take. I wondered if you could just sort of expand on that, is there a significant difference AMOG and SNG catalysts by type in terms of the refill timing? And in terms of the outlook for reloads looking forward are there any particularly areas where you would see an acceleration of that activity in the next year or two?

And then secondly you talked about the fact that some of the catalysts are base metal, in fact I think the majority, but some are precious metals, to what extent is there any advantage in the fact that you offer a closed loop recycling service to customers in relation to the base metal chemistry?

.....

### **Geoff Otterman, Division Director, Process Technologies**

Okay I've jotted them down; hopefully I get to all of them. On the refill business, I think on our biggest catalyst consumption customers the life would be four years, five even - three - so around that number. And we'd see that in methanol catalysts, we'd see that in ammonia, we'd see some of it in hydrogen and we'd see the same in SNG, I don't think there's significant difference in them. A lot of times it will be time to when customers have to do their turnarounds, when they have to do maintenance on their units. So that's why the timing happens that way sometimes.

Anything accelerated on the - sorry accelerated growth ...?

.....

### **Adam Collins, Liberum**

In the next two years where will the reload activity be particularly promising do you think are there any particular categories where that will show through most?

.....

### **Geoff Otterman, Division Director, Process Technologies**

Well the reload - the most significant reload - there's not going to be any reload activity on the substitute natural gas, because we're just now selling our first fill. So refill is going to be 2016, '17, that type area. So all the refill business is going to be hydrogen, some of the things we saw in the petrochemicals, hydrogenation catalysts we sell in

## Johnson Matthey - Analyst and Investor Day 2014

petrochemicals and methanol and ammonia, so. And I guess on the Formox, the formaldehyde it's shorter than that, it's kind of a one year turnaround, one year catalyst life on that.

And finally base metal catalysts versus PGMs, we don't do any reclamation on base metal, I mean we can provide some services with customers and we can direct their materials to some of the refiners, base metal refiners or reclaimers that we partner with. So that's just part of the service we have, but Johnson Matthey - we don't have any real economic advantage if you will. So there's really no JM closed loop on that.

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### **Charles Pick, Numis**

Just on slide 14 where you showed the investment for growth, the 5% of sales spent on R&D and the two times depreciation for the capex spend, do you think your rivals are matching that and is there any sense that the industry is becoming more capital intensive over time?

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### **Geoff Otterman, Division Director, Process Technologies**

Let me see, I mean we do see our rivals spending on capex, we see them acquiring other smaller catalyst companies. I haven't heard aggressive plans, and this is for the broad range of things that we're looking at. You have to remember a big part of that capex spend would be in the gas to liquids area, so that would be - call it a quarter of that spending. So that would only happen if we sell that business and we're not going to build plants opportunistically.

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### **Andrew Stott, Bank of America / Merrill Lynch**

I just wondered are there any domestic Chinese competitors at all in this area?

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### **Geoff Otterman, Division Director, Process Technologies**

Loads.

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### **Andrew Stott, Bank of America / Merrill Lynch**

Why do we never hear about them?

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### **Geoff Otterman, Division Director, Process Technologies**

Why don't you ever hear of them? Well within the Chinese market we haven't seen them all that much, although they're starting to develop new technology and we see small companies, but if you look at a company like Sinopec (?) I mean they're a huge company and they're selling catalyst within country and also starting to export - and they're exporting to the rest of the world. There will be some business that won't get because Sinopec (?) will get it.

But there are other - absolutely lower cost competitors that we see in China and we're counting on - the companies that we seek are the ones that have kind of the same economic safety drivers in their plants as we'd see in the rest of the world. But we definitely see smaller kind of methanol plants popping up across China and those are the ones that are not really in our market space.

.....

**Question**

Do you have any companies that effectively copy your product, such that you have to try for legal enforcement of your IP, particularly in China? Or is it the case that there's enough differences in the product itself and it's just not enforceable so you just have to basically count on customers choosing your because of the product itself and not have IP enforcement be an issue?

.....

**Geoff Otterman, Division Director, Process Technologies**

I'm trying to think how to best answer that. We've had some instances of where we've seen companies copy our technology and do what we can to enforce it. So on the catalyst side - I don't think we see it as much - I don't think we've seen it on the catalyst side. I mean we've been able - I mean part of the business model that we try to employ is the continuous improvement of our catalysts, so we're giving customers an advantage over the previous generation of catalysts we've sold to them. So as long as we can differentiate that way you know we're really trying to stay ahead of things like that. So we'll see some, but it hasn't been a huge, huge issue to us yet.

A couple more and then we'll take a break and just for the housekeeping we'll have a Q&A session at the end to mop up anything if you haven't been able to ask us.

.....

**Martin Evans, JP Morgan**

Just on the China appetite for coal again, I mean at the moment there seems to be a bad press surrounding coal for coal fired power station and so on and a push to reduce that dependency. Do you think whilst chemicals production is being encourage, do you think there is a slight risk that the Chinese government turns its attention to chemicals from a pollution angle and the emphasis sort of is reduced?

.....

**Geoff Otterman, Division Director, Process Technologies**

Henry is actually going to address some of the things here, but what we see still in China is that the projects are being approved. It's a key part of the five year plan that's been put out so projects are being approved. I guess the things you raise are why we've stopped being bullish kind of towards the end of the decade because it feels like there's a lot of momentum behind it and projects are being approved, plants are working and it's going to happen for a while. So Henry might want to comment on that during his presentation, it's one of the parts we talk about a bit.

.....

**Question**

When a customer announces they want to build a plant let's say in three or four years' time starting up, obviously you have enough time for your own capex, because your own production is at least probably smaller. But is there any time constraint in terms of meeting the timeline for a customer, in that - do you miss on - I don't know is there something like an R&D overrun or something where you just can't - has a plant ever not started up of a customer because you were the bottleneck?

.....

**Geoff Otterman, Division Director, Process Technologies**

Because we couldn't supply a catalyst is that it?

.....

**Question**

Or new technology wasn't ready because - in other words how bespoke is the chemistry?

.....

**Geoff Otterman, Division Director, Process Technologies**

Well the company wouldn't progress without having the idea - we have well defined technology and flowsheet design, so that part wouldn't happen. I guess what could happen is the catalyst wouldn't be ready by then. That's not happened, certainly not in my time here, I'm trying to think of any examples - it would be kind of a cardinal sin for that to happen. So I think we'd probably rather not quote on something if there was a risk that we couldn't deliver the catalyst in the prescribed start-up time.

Okay, all right well thanks for your attention on the post lunch shift. So we have 20 minute break here, so go out and get some coffee and Sally says we're going to start promptly at half past three. So thanks for your attention.

.....

**Coffee Break**

.....

**Adding Value Through Technology**

**Iain Martin, Technology Director, Process Technologies**

Good afternoon ladies and gentlemen, my name is Iain Martin; I am the Technology Director for Process Technologies Division. I'm a chemical engineer, I started 28 years ago in the Davy business and I joined JM through the acquisition of Davy in 2006. So my background, I've designed chemical plants, I've commissioned them - I worked abroad commissioning plants, I had a spell negotiating contracts in China and the Middle East and then four years ago I switched into technology management, initially within Davy and then a year ago I was invited to move up to the divisional role when this role was created.

## Johnson Matthey - Analyst and Investor Day 2014

I guess my background from Davy - I can give a bit of a flavour for what it's like to be bought by Johnson Matthey. And I'd say it was a very positive experience ...

Laughter

Strange that. No they've been a very encouraging parent and the business has at least doubled in size since 2006, so it's not an unpleasant place to be.

I'm going to give some background on what we do frankly on the technology side and then cover some of the more significant markets on the chemical area that impact upon our revenues.

Henry Liu will then cover our activities in China and more specifically SNG, synthetic natural gas, which is strongly focused on to China. I appear to have picked up three questions from the earlier session, I'll try and tick them off as we go through, but forgive me if I don't we can do it at the end.

Johnson Matthey fundamentally is a technical organisation and technology differentiation is a key factor in our approach. Around 10% of our staff are in R&D, at the moment that's about 230 work in R&D inside the business and we also access a proportion of the central Johnson Matthey R&D down in Sonning that you may have heard of before.

We expect to spend 5% of sales revenue on R&D and broadly grow that in line with the business. So you've seen the growth expectations, so that means we need to be growing R&D quite significantly as well and we're looking to invest in facilities to enable that, to keep pace with that growth. Most of our R&D at the moment is in the Northeast of England, which I would say is our kind of our core capability area, but we are looking to grow forward in America where we have a facility in Savannah and Asia, which we view as key growth areas for the business.

We are a catalyst company, but integrating more process technology around the catalyst provides greater opportunity to develop into new markets and provides greater resilience to the competitive threat.

We aim to be pretty effective on our R&D and I will go into more detail about quite what that looks like in a little while. But we do pay very close attention to the economics of the final projects that we would look for. And we only really try to back those where we see there's potential significant revenue to return the costs related to the R&D programme.

We were asked the question around CO<sub>2</sub>, well actually the picture on the left, bizarrely is around a piece of technology that actually has application where we're looking for low CO<sub>2</sub> flowsheets. It's from Coogee Chemicals in Australia, it's a gas heated reformer and it's one of the technologies we have in the Syngas area. We'll be mentioning Syngas quite a lot, all it means is that it's a mixture of hydrogen and CO carbon monoxide that's all we mean by that.

Johnson Matthey has probably the widest range of technical options in the Syngas generation area and this is probably the most advanced piece of kit out there

## Johnson Matthey - Analyst and Investor Day 2014

commercially operating today. It's particularly good where low carbon is important, for example associated with the Californian Low Carbon Fuel Mandate.

Some of you may well have seen the JM competency cogs before, they reflect the areas that Johnson Matthey believes we have capabilities in and PT uses all of these. On the right hand side are the chemistry skills, over on the left the more manufacturing relating skills and in the middle are the licensing. And I'll give you more background on all of these shortly.

We have been doing this rather a long time, we've been licensing in China since the mid '70s, so we have decades of experience in all of these areas. And that combination of skills is quite rare, particularly amongst organisations that are independent of chemical majors. Several of our customers find that us not having the potential to compete directly in their markets is attractive.

Again, the second question that came up was about the - sorry that rareness makes it one of the reasons that our other catalyst companies don't do this, there isn't that much capability just out there to go and acquire.

So let's start now and discuss the first of those elements, the ability to develop new catalysts. It's not that straightforward funnily enough. First of all you have the chemistry knowledge; we have a huge amount of experience around understanding the chemistry, particularly associated with the catalysis and the chemistry that's actually occurring on the surface of the catalyst. But our chemists also need to understand the application, how the catalyst will be used, what's important to the end user customers and is there a feedstock efficiency gain, is there a way to reduce capital cost, product quality improvements. So they need to understand the final application.

They also need to understand how you make catalysts and what can fit in both our manufacturing process, but actually what is economic in manufacturing. And the final element is catalyst testing. It's actually relatively easy to take a catalyst and put some chemicals over it, it's actually quite a lot harder to do it in a manner that is representative of what will actually happen in an industrial application. And we have, as I say, a lot of experience in doing this and we're pretty good at it.

Let me give you a brief example, on olefin crackers you need to be able to remove impurities from propylene, there are catalysts out there that do this today, but we have developed a new version utilising our chemistry skills in promoted precious metal catalysis. Catalyst is made up of support, we then put on palladium in a very controlled manner, a second promoter and that second promoter is what is controlling the by-product, or the reactions of the impurities, but it enables us not to react the valuable propylene in the first place. So we end up with a catalyst that's highly selective and because we're using less metal is lower cost. And obviously those are benefits that are attractive to our customers.

It's been developed in house, tested on our own rigs and is now in operation in a major plant in Europe. And we see that same catalyst having application in a number of other places.

## Johnson Matthey - Analyst and Investor Day 2014

So we've now designed a clever new catalyst, the ability to scale it up and actually make it is a different skill set. And this can equally apply to a third party catalyst that another company - another operating company for example has developed in their laboratories and they now want it manufactured.

The first part of that is actually to make sure that you're offering to simplify the production route, we've had examples of companies coming to us with ten manufacturing steps and we've been able to simplify that down to three or four. This clearly both creates value, but also intellectual property that we can then use.

We have a range of equipment to enable us to manage the risk associated with scale up, both from the laboratory through to pilot scale. And now the picture on the left is a pilot spray dryer, this is out in Savannah in America and so that's putting liquid in the top and making fine particles at the bottom. And from there we can then use that to scale to the full scale which is the picture on the right. And that is the new D Plant, or as we call it the new zeolite manufacturing facility, again in Savannah. If you see the little people on there, that gives you a view of the scale of this thing that we're dealing with and Don will talk a little bit more about that.

As I said before we are a catalyst company, and being able to manufacture efficiently, globally is an important part of our business and we focus a portion of our R&D specifically on improving manufacturing processes as well.

Now moving beyond the catalyst, a greater understanding of the process around the catalyst creates differentiation and added value through great understanding of the market and the process requirements. We've proven capability to build and guarantee whole processes. Much of this capability today is in the JM Davy business, but also Formox as well. I remember counting up when I was at Davy that they commercialised 15 new processes over the previous 15 years. So it's a pretty impressive record and there's considerable confidence in our ability to do this.

One of the features there is that we don't go through what we call a pilot scale, the larger chemical plants that would be an intermediate scale of operation; it's generally too expensive and leads to an uneconomic asset at the end. So instead we use mini-plants which is the picture on the left that operate, these are a small version of a full chemical plant, it'll have all the features, it has all the recycles and we use that to generate design data and reassurance that we can go to full industrial scale. We go from tests done at this scale, up to a full scale operation.

So the example here is for M 5000, which was at the time the world's largest methanol plant in Trinidad, 5,000 tonnes a day, that's over a million tonnes a year of methanol, where we introduced a completely new reactor design into the plant. And we did the test work on the catalysis maybe an inch diameter reactor. We did additional test works and modelling and this is a CFD model of what's going on inside the reactor. And then from that we went straight up and were confident enough to build the first demonstration of that reactor, which is the picture on the right being lifted into place. The weighs 600 tonnes and it's part of - that plant probably cost \$500m to build.

## Johnson Matthey - Analyst and Investor Day 2014

We had to convince the banks, it wasn't just us saying this - the banks and the customer and the end user all had to believe that this technology would work and it did fortunately, hooray.

So as you can tell we're quite confident in some of this stuff and it's also - we're pushing some boundaries here in what we do.

And the fourth element and the final element really is, as I say, the technology transfer really. Once we've developed some interesting technology we still need to actually convince someone to take the risk and build that first plant, or try the first catalyst charge. We do not operate the end use chemical plants, okay we'll design the technology and we'll make the catalyst, but somebody else will operate them. So we have to convince them that that risk is acceptable. So risk management is key.

The technology proof, so that's where the mini-plants fit in, how do we convince somebody that we actually know what we're doing, and again - we've done this enough times that people start to actually believe what you tell them, which is great.

But there's also technology transfer, actually how do you take a design, successfully build it, in Inner Mongolia and work with Chinese engineering companies who will then do the design to actually put it into practice. And again there's a lot of skill and a lot of knowledge and experience that goes into that as well.

Relationships and alliances also have a key part to play here. So we have relationships with Air Products in hydrogen, again Don will talk more about this, but they give us an opportunity to test out new catalysts and also give us market direction as to where we should be spending our R&D effort.

And finally protecting our knowledge of course is very important. We do that by a series of patents, some of it we keep as knowhow, we try to manufacture some of the key steps on our catalysts in house and we further add a layer of technical services around. So you end up with quite a complex offering which is quite difficult for somebody else to actually offer.

So a further example - so not only do we use this technology capability to main and strengthen our position in existing markets, but we open up new markets. And so here's an example. We've talked a little bit about methanol to olefins, so this is the conversion of - the production of propylene and ethylene going into polypropylene and polyethylene; you'd use them in plastic bags, carpets, those sorts of things.

This is in China, we were involved with this project supplying the methanol plant, we'll actually show you a picture of it later on. But in the process they make butenes and it's a by-product here. And basically they just spin it back round to the front effectively as fuel.

Through our oxo alcohols experience we have technology - we developed technology that could convert butene to a more valuable product. So watch the animation it's going to happen here. So 2 - Propylheptanol - so it is an intermediate to plasticiser alcohol and it's used in coatings on wire and cable for example. So it makes a better plasticiser than

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alternative products and starts from a cheaper feedstock. And so the first of these is going into operation later this year, off the back of the first MTO plant and we anticipate further. It's just an example of how we can continue to grow our markets.

The title of this section is adding value to technology so I guess we want to say a little bit about how we do that. I'll have a go. On the right is the simplified model of how our customer would price up the production costs and the margins that they would make. So the biggest cost and this is just an example, the biggest cost is really the feedstock and that's quite normal. There would be - the catalyst cost is generally relatively small. That's quite important, if you remember taking a chance on a new and unproven catalyst actually has a very small impact, it can have an out - the cost is you say very little, the impact on the final product is very high. So it's one of the reasons that actually having the best catalyst gives you a very good way of maintaining market position.

So we have raw materials, utilities would be steam, cooling and water, so the operating costs and the cost of the plant itself would be depreciation and return on capital employed. So those are in simple terms the major elements that build up to a cost of production, in this case 900 - I've guess the sale price of 1,000 because it makes the numbers easy and that gives them their end use margin.

If we can make an improvement - well actually we can make improvements in all of those. What we do can improve efficiency, it could impact and reduce the catalyst cost, it could reduce the amount of utilities used and it can change the complexity of the plant and make a cheaper plant. We can influence all of those elements. And generally - and we would look at what is the value that we bring to the final customer and we look to get 20 to 30% of that value - so as a general guide.

Clearly it's a competitive environment that plays a part as well. So that benefit if you like is then taken in a number of ways, it could be taken on the catalyst, just as an improved catalyst price, or it could be in licence fees. Technology fees, technology transfer fees, engineering fees and services generally is a smaller part. But we can play - we can alter how we take the value between catalyst and licence fees and in different markets a different approach is merited.

In terms of the sort of size of impact that we could make, about a half a percent efficiency change on an existing process would be reasonably significant. You can do more, but it tends to then take - if you take a different feedstock, or a completely different process route then we can start to make even bigger changes or maybe a 10% change on capex again would be viewed as quite a significant step in this market.

So to summarise the technical piece, people are the core of what we do and actually the people in the organisation are very excited about the opportunity. And it's an interesting role they have. They are answering difficult and challenging problems and we seek out those hard problems because that's where the value is on the ones that are easier to maintain.

We are proactively growing our capabilities in R&D, it takes - it can take two to three years - a couple of years to put in a new R&D facility so we need to be planning ahead

all the time and that is what we do both in terms of R&D and in the technical services that we need to provide out in the regions.

The third point, we're pretty good at what we do and it gives us a very solid base to grow here. And the fourth is we're very conscious we need to ensure that that advantage continues. And protecting that knowhow remains very important to us.

I'm happy to take questions after when Henry comes back.

.....

### ***PT and the Chemicals Market***

#### **Iain Martin, Technology Director, Process Technologies**

Now let's return back to the Chemicals market, Geoff mentioned we consider the business kind of split in two, Chemicals and the Oil and Gas side. So I'm going to talk a little bit about the Chemical sector here. Just a refresher really on the global drivers and a particular reference to the Chemicals side.

Underlying Chemicals growth is sort of 2 to 3% globally, so why is it that we think that we can do better than that? Well, inside the global growth there are actually a lot of significant shifts taking place at the moment. And that's creating a lot of change in the industry and generally speaking for us change is good, change helps us.

We are seeing continued growth in the developing regions on end use chemical products, China is growing at 7, 8% at the moment. And the manufacturing of those chemicals is moving to align with that, so that's causing change. The US Chemical industry with shale gas is effectively kind of going back to where it was 30 years ago, it's really being rebuilt around the improved feedstock position it has.

China has an increasing use of coal for energy security, the energy demands in China will remain very significant, coal for some time yet is going to play a significant part in that. And the fourth element, actually consumers really do have an interest in green and renewable products. And again that's creating a focus in that area. So as I say change is good for us. Actually the quantity of change is relatively unusual I'd say of time in the business. But it creates some pretty exciting times for us inside.

Now Geoff said this is a simple version and it really is, it does get a lot more complication than this. And we've tried to offer just a simple view and we're only really looking at the larger areas. Our linkages across are in reality a lot more diverse and we have regular contacts with virtually all of the producers in the chemical industry.

We've split the markets, Syngas, which as I said CO hydrogen; it covers chemicals derived from C1, that would be methane and coal. And this reflects that increased focus on products derived from gas rather than oil.

Petrochemicals are going to remain extremely important as there are many products that realistically can't be cost effectively made by any other source. And bio, well there

## Johnson Matthey - Analyst and Investor Day 2014

are opportunities here, but as the question alluded to earlier they can also be disruptive. And so we need to understand this area and I would say we do.

I can't cover everything here, we've picked out a few examples to give you a flavour and feel free to ask the rest of the team outside on some of the other areas. So the dark blue ones are the ones we're going to talk about, Henry will cover SNG and I'm going to talk around the rest. So we tried to pick a few just across each of the areas.

We're going to use this format through the remaining presentations, so I'll just try and give you a bit of a flavour because we're not going to go through all the text there, there's far too much to try and cover everything. But we've presented it there and we'll try and give you more of a flavour for how we see these individual markets. So the picture on the right is a gross simplification of the feedstock and product uses.

We try and give a view as to what is it that we're offering, is it catalyst, is it licensing or is it both? I think that helps. What are the major market drivers that are impacting this particular business? And then some commentary about both the end user market and our position within it. Each of the markets is slightly different. It's actually - and that's the reason the way it's being described is different in each case. And there is a little bit of information on competitors, although we're probably not going to dwell too much on that.

So turning to methanol. Main chemical use for methanol is onto acetic acid, which goes into vinyl acetate, which you'd probably pull from PVA glue that your children would use for their handy crafts. All going into terephthalic acid for polyester, either in fibre or in bottles. So it can be blended into fuel, up to 15% you don't need to make any changes to the cars and vehicles. And at that kind of level it's already being blended in China.

And a relatively recent use of the feed stock is the manufacture of ethylene and propylene going into polyethylene, polypropylene. Pretty much a Chinese driven market where the need to upgrade coal, and it's kind of associated with the freight capacity limitations between western and eastern China. Henry is going to talk more about that specific Chinese area.

But in methanol we have licensed 25 million tonnes of annual capacity since 2001 when the M5000, the methanol plant I showed you the picture of the reactor earlier, so we've been very successful here. On the catalyst side we have a share of the sector of between 40 and 50%. We continue to see activity in China, maybe slightly slower rate than over the last few years, but the US projects are also picking up now based around shale gas. And we actually started up one of our plants last night, first introduction of feed stock.

On our perspective talking to these customers, our expectation is for 6% growth here, annual growth. That's what we're planning on. If it's more than that we'll be delighted.

The picture here is Shenhua. This is the world's largest methanol plant. It provided methanol into the first methanol to olefins unit. In this particular case we designed the methanol plant. We then passed that design to a Chinese company, and they did the detailed design, constructed the plant. Our engineers went back to help them

## Johnson Matthey - Analyst and Investor Day 2014

commission and start up the plant. We supplied the catalyst for that plant. And now we provide ongoing plant support and look to resell next charges with catalyst, and I think we've put in the first resale now.

And that's fairly typical of the kind of the realm in the process technology side of the business. That plant has been running since 2006. And again, if you - sense of scale here, there's a minibus at the bottom, that little blob at the bottom is a minibus so this is an enormous plant.

Moving to an area that's, from a plant perspective is a little bit smaller. Formaldehyde is a new product for Johnson Matthey. Came in with the Formox acquisition last year. It's a fantastic acquisition. We are excited by the prospects here, as it's a logical fit given our position in methanol. Major use is in gluing wood chips together into MDF fibre boards in wood panels, into IKEA furniture and so on. But it also finds use in a wide range of chemical reactions, because it's a particularly reactive chemical. Overall growing at the moment at around 5% rates.

You can make formaldehyde, there is two routes. One is oxidation over a silver catalyst, or you can use malebda monoxide, and that is the Johnson Matthey process. Silver, of the market about 60% is silver at the moment, 40% or so, 40%/50% is the oxide. And Formox has a high percentage of that catalyst sector, around 70%/80% market sector.

But we see significant synergies here, and are excited by the possibility of using the combined skills that we bring on catalysis from Johnson Matthey, and with JM Formox. And if we can, one particular focus if we can create a technology that is competitive opposite the silver sector, then all of a sudden we're now in a much higher leveraged growth rate here. And we do see opportunities here and we actually do have plants operating in that side of the business. So it's an interesting area for us.

So gas to liquids refers to the conversion of methane to coal via syngas to lubricants and diesel with a low sulphur content. Sasol and Shell both have plants using their own technology, but this equates to a tiny proportion of the overall diesel production pool as of today. We have two sides to this market. Both are quite embryonic for Johnson Matthey, we licence - we have technology for licensing which we developed with BP, and we supply catalyst both for the syngas production part and the Fischer Tropsch end, over to a wide range of potential technology owners, including BP itself.

Low gas prices and stable high oil prices makes such projects viable, and we're seeing increasing interest in new projects. Although these projects are still early stage, and generally will take four to five years to construct. These are - a typical GTL plant would be at least kind of \$2bn to construct, which would be the end user cost. So we would expect the revenues here to be hitting more at the back end of our ten year plan.

We've brought considerable R&D into this area over the years and so if this market, or as this market progresses, then we are well positioned. It has the potential to be significant for PT, and £75m of our annual revenues may well come from GTL by 2020.

So moving on to petrochemicals. One of the major areas is oxo alcohols which is a collaboration with the Dow Chemical Company. We have a sector leading position and

most operating plants use our technology. The oxo reaction here refers to the reaction of an olefin to aldehyde. Products are used as industrial solvents, and plasticisers particularly PVC makes it more flexible. This is primarily a licensing opportunity, though we do sell some catalyst here as well, and has been very successful over the last few years, particularly with significant capacity additions in China. The market is affected by the chemical cycle, and it can be very lumpy, as Geoff referred to earlier. But we continue to see a bright future for this technology, constantly developing improvements and bringing on newer versions, including the 2PH process, the better plasticiser which I mentioned earlier.

The picture in this case is Chi Lu Petrochemicals. This is our first oxo licensee in China, 1978. And they've continued to invest, and this is actually the 2003 version of the technology, what was at that time the latest technology.

One of the questions was do we have a technology gap to fill? And I would - and my answer here would be I think one of the areas that is a focus for us is the chemical production from gas rather than oil. And we are keen to develop more processes that actually derive from methane, going into chemical products. And this is one example of that. This is the first but we have others in the pipeline behind.

So mono ethylene glycol is one of the largest intermediate chemicals, and it's a key component in polyester fibre and again PET bottles. And it gets used in antifreeze in your car. It's a technology we've developed in collaboration with Eastman Chemicals, and we announced it being available to licence last November. It was developed in many plants. This is ours in the north of England. And Eastman also have facilities in Kingsport, Tennessee.

Conventional route is from ethylene, but our route is from methanol which makes it particularly attractive in China and locations with low gas costs. So this is an example, on the focus of seeking technologies, that derive from gas rather than oil. It's relatively early days but we're actively seeking our first kind of commercial reference now. Our relationship with Eastman prevents me discussing in any detail here, but I would view this as an exciting prospect. It's an attractive market; it's a large size, particularly in China. And we have an interesting offering here.

And bio-renewables. Okay moving onto the third area. JM takes sustainability very seriously in all its forms, and one area is developing improved processes and catalysts for the production of either chemicals or biofuels from renewable sources, which can be from palm trees, rapeseed oil, wood chips, or even waste oil from McDonald's fat fryers. We are more focused on the catalytic transformations rather than fermentation. We're actually already a significant player in the oleochemicals arena. We're the number one supplier of catalyst into fat hydrogenation, and have licensed over a million tonnes of capacity for the production of natural detergent alcohols, which go into a wide range of applications including cosmetics. So we're already a major player in bio.

The skills I mentioned at the beginning are valuable to technology companies working in this area, and we have strong links to a wide range of those areas. We tried to focus on those areas that we see as having the greatest potential, and are well positioned in the sector as it continues to develop. I think there was a specific question about butanediol.

## Johnson Matthey - Analyst and Investor Day 2014

We have at the moment petroleum technology for butanediol which actually there is a competing route now appearing, a biological through succinic acid. And we are working with Myriant actually to take succinic acid into our existing technology.

So I would say it's an area that again it can be destructive, but actually we also see it as a benefit creates further change in the industry. If it happens we would be very well positioned as the leading company in butanediol technology. So actually changing the feed stock there, actually in that particular case, would help us. And that's an example of how do we pick where we want to focus. There's a lot of technology in the bio area, not all of which is likely to be economic. So we're quite narrowly focused on things that we believe actually have potential. And we do then invest both, particularly in our time and our facilities, in working with these companies to develop and introduce the technologies.

As I say, the ability to confidently commercialise technology is very attractive to a start-up bio companies who have the technology but actually they don't have the track record and how you take it from where they're at.

Okay that's the end of my piece. I'll now pass over to Henry who is going to tell us all about China. Thank you very much.

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### **Henry Liu, Country Director, China**

Good afternoon everyone. Thanks Iain. I'm Country Director for PT in China. I joined Johnson Matthey in 2006. Sorry I'm Henry Liu; sorry I forgot to introduce myself. Worked for ECT for six years in China, moved to PT in 2012, before that I worked for ICI in China. During the break some people asked me when is the Chinese New Year, and actually you know it's just happened one and a half years\* ago (\*Should be hours not years), you know Chinese New Year just started, the year of the horse just started. Coincidence, just the same time as our event starts so we picked the right time.

All right, so we did an Investor Day focused on China in year 2010. I was part of the team representing China at that time, and today I'm here again. I want to report back with you what is the progress we made in China during the last three years and the exciting growth opportunity in PT, for PT in China.

You already heard what Geoff said, the key changes that drive our growth, and one of the key drivers is the coal to chemicals in China. I will spend the next 20 minutes to explain to you all the coal to chemicals in China, and what is Johnson Matthey's position in this exciting growth market.

First of all I want to give you an overview of the PT in China. We started the business with an office back in 2001, and currently we have 120 people more to work with us. And the number is growing. And with all the BUs operating in China currently, we've already started establishing very strong positions in our chosen play area, and 58 licences already signed so far, with 22 in coal to chemicals. Business already forecasted - our business plan for China with double digit growth in the next ten years. One of the key drivers is coal to chemicals.

So why coal to chemicals? Quite a lot of people just asked me during the break. The main drivers for the coal to chemicals, you know, for China, are the energy security and also economy of growth. And probably you all know that Chinese economy slowed quite a little bit in last three years, with GDP growth at 7.7. With your terms probably it's still very high, but we say it's very low. So the forecast of GDP growth for next few years is still at about 7%. As I just pointed out, GDP - chemical growth demand is normally at twice that of GDP growth. And Chinese government's five year plan for the urbanisation programme further developed, you know drives the chemical growth in China. So according to the IHP forecast, China will count one quarter of the global chemical demand, basic chemical demand, by the end of the decade.

China imports large amounts of chemicals, and the government are eager to close their import deficit. And China have the structured supply and demand imbalance, and keep you know importing a large amount of the oil derivatives. And also China imports more than 50% is oil demand, which is a cause of great concern of the national energy security.

With the consideration of their huge energy demand to support its GDP growth, China's policymakers choose to go for the coal to chemicals for its alternative multi feedstock approach. As a result there are multiple investments, operational improvement, technological maturity, coal to chemicals proved to be a competitive chemical route, and is supported by the Chinese five year plan. Moreover, and we talk about question to Geoff talking about the air pollution issues in the metropolitan cities, and small cities in China during last year or early this year, which directly approached the clean energy development plan in China.

Let's talk about the coal to chemicals and what we refer to. China is becoming a leading player in the development of coal to chemicals, and China has 13% of world coal reserves which contains, you know, majority in the North and North West regions. They are four fast growing areas in the coal to chemicals areas. Namely - coal to substitute natural gas, coal to methanol, coal to ethylene glycol, coal to olefins, where, you know, Johnson Matthey all have the technologies to supply to these sectors.

In the past two years the modern coal chemical industry are developing very fast in China. In March 2012 National Development and Reform Commission, we're called NDRC, published the coal industry five year plan. The programme asked the areas with the right coal species and also adequate water supply to develop coal to chemicals projects, especially when it comes to support to SNG, olefin, coal to olefin, and other local coal chemicals based around the advanced technologies. And they want to speed up the commercial application of the advanced technologies. As expected there are a large lump of the core chemicals already approved, and also likely to get approved in the near future. So there are plants already in operation and the construction of pending government approval, with quite a lot of projects already choosing Johnson Matthey as technology and catalyst provider.

Most of the coal chemical customers are big state owned companies and some of them are very familiar to you I would think, they are Fortune 500 companies such as you know Sinopec, CNOOC, PetroChina and Shenhua Iain just mentioned.

## Johnson Matthey - Analyst and Investor Day 2014

Talking about the coal flowsheet in China, not that different from what Iain just described in his slides earlier. Among all the key coal industries, the usage of coal to chemicals is the fastest growing area. You can see the coal to chemical flowsheet from the diagram with the colour highlighted in blue where Johnson Matthey has a technology and a product service to the industry.

Johnson Matthey's coal flowsheet covers most of the growing coal to chemical market in China, especially as Johnson Matthey already established a leadership position in SNG and also methanol area. China has become by far the largest methanol producing country and region in the world, just talking about the global market. I just want to highlight the Chinese market to give you a little bit of flavour of how important this market is to us.

China in the market represents 15% of the world methanol capacity, and producing 40% of the world methanol in 2013, last year. And China is still in the major expansion period adding capacity with 28 metric tonnes per year, capacity planned to be added through 2016.

Johnson Matthey has already signed 16 licence agreements for the methanol projects, and with five already in operation, with others under construction. Our targets - will talk about SNG particularly in detail in the next slide.

You already heard Geoff said this is a very important area and it's also the majority in China market. So the substitute natural gas or SNG we call it, has grown rapidly in the last few years, and is expected to have strong growth in the next few years. The SNG - mainly it's built for energy demand and will achieve some level of the energy independence from the foreign energy suppliers, and also improved environmental performance for its energy users. That's another benefit to develop the SNG.

There is increasing concern on the air quality in China, especially in the big cities as I just mentioned before, but Beijing particularly. Government launched a pollution better plan last year, September time, probably most of you heard about that. This plan includes, you know, the three big cities, Beijing, Shanghai and Canton area, and drive those cities to reduce direct burning of coal, and also in the surrounding areas.

By the end of the decade - so with the gas demand in China expected to grow to 350 billion cubic metres per year, with a significant portion of the gas we would expect coming from SNG processes. And this will, along with some of the domestic gas production, gas imported via pipelines and also imported liquefied gas, will have a diverse supply of the gas in the marketplace.

With the production of the SNG estimated to be 80 billion cubic metres per year, and we estimate there will be a lot of SNG plants that will be built in the next few years. So far nine SNG projects already achieved governmental approval with capacity up to 23 billion cubic metres per year. 13 projects already acquired government preliminary approval. I will explain to you what that means later on, with capacity up to 54 billion cubic metres per year, which is consistent with the target established in the Chinese government's five year plan.

## Johnson Matthey - Analyst and Investor Day 2014

So just to give you a little bit more about what the approval means, and what it means preliminary approval for approval. Preliminary approval means if you get the preliminary approval you can start the project work; you can start the selection of the technologies and also start the construction of your plant. For approval only when you want to have your plant for operation, then you need full approval. So in a sense, so with the preliminary approval actually you can build your plant, that is a milestone for any coal to chemical projects in China. By the way, you know all the coal to chemicals big plants need government approval.

Johnson Matthey's first success in this market was achieved with the licence technology to that target in 2009. This plant became operational in 2012, in Inner Mongolia close to the coal sources, and with adequate water supply to that area. It's now successfully exporting the gas to the Beijing market which now is contributing to the Beijing air quality now.

Johnson Matthey has now signed licence agreements for seven SNG projects in China, hence established a leadership position in the market. Currently we mainly compete with Topsoe and Lurgi in the marketplace. So not surprisingly you would think there would be you know local technology and catalyst and development currently in China. Our offer to the market is a package of the licence and technology and engineering service and catalyst supply. A typical project, just to give you some flavour and what that means to us, using probably around £7m to £8m worth of catalysts and £3m to £4m of the engineering and licensing fee, which you know gives us an estimated market size about £300m to £400m by the end of the decade from now for the new plants.

Catalysts life, as Geoff just highlighted in his area, just talking about the life and above - sometime around three years. So a significant part of our business will come from refill business in future, and estimated market size about £50m to £100m when all the plants are running.

To service this important market in China we have invested a strong commercial and technical service team in China. So you already heard you know we have 120 people there. Most of those people are the engineers and also salespeople. We are developing plans for investment of a new catalyst plant in Shanghai to service this market.

I will think most of you have a key question to say how we - where we see ourselves and you know this market, and do we have a - can get the refill business in future? And we are quite confident. Reason for quite a few of - I want to explain to you all here. Johnson Matthey has established very strong positions, and typically the value fits well with the market requirements in China which positions us with other advantages. As Geoff and Iain explained, the value of the catalyst that we supply to the processes such as SNG or methanol is quite high, £7m. The methanol - the value of the catalyst is much lower than the overall project. What we're talking about is several billion pounds. All the value clients can use our products to make their product, which is several million, hundred million pounds a year.

So hence all the customers always push us to lower their catalyst price, but they're often reluctant to switch to the improved catalyst which will probably jeopardise their asset or

## Johnson Matthey - Analyst and Investor Day 2014

plants, so they wouldn't do that, you know. We haven't seen that happening, especially in our methanol plants which we signed, you know, licences for.

Johnson Matthey continues to develop and improve the technologies and catalysts as Iain just explained. We are staying ahead of our competitors. We have successfully done that in the methanol market. We will continue to do that in the SNG market. Provide improved local technical support and service because another step ahead of the competition. We have invested heavily on technical support capabilities in Beijing to provide assistance to our customers to get best value from our products. This service is available in customer's language and also their time zone, and also can draw on global technical service from the wider Johnson Matthey team.

Closer client relationship as Iain just explained is another step we are now developing. This is partly as a consequence of providing more effective local technical service. Localisation of the catalyst production is another step we are now planning. We are planning further investments, increase manufacturing catalysts in China, localisation will give us flexibilities in meeting our clients' needs.

Overall Johnson Matthey has a long history - PT has a long history in China. Iain just said we licensed oxo to Chi Lu back to 1978, so which is - we have a long history, track record in the market. We've licensed over 22 projects in coal to chemicals sector so far in China. Davy as a brand is very famous in the industry. And we already established very strong relationships with these key players in the market as I just listed, you know those names, the Sinopec, CNOOC or Shenhua. They are all our customers. They're already experience to our technology and service already.

A number of the technologies from Johnson Matthey are choosing for this demonstration programme so called in China, and through those demonstration programmes industrial people understood that by choosing the advanced technology is a key step for their project success. And with the continuous development for new technology and products, Johnson Matthey is ahead of the competition, in our choosing playing area, especially the methanol and SNG areas in China.

So overall Johnson Matthey is well positioned to the rise of the coal to chemicals in China. That's probably all from me, so Geoff I'll probably hand over to you to summarise the section.

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### **Geoff Otterman, Division Director, Process Technologies**

Okay, well thank you Iain, thank you Henry and I'll just real quick wrap up, then we'll take questions for 10 minutes, 15 minutes, something like that. Do something like that. Well not much more than it says there on the tin, strong positions in target markets. Talked about good positions we have before in methanol, ammonia, and we got some pretty aggressive plays in this area in substitute natural gas area, and in gas to liquids. So a couple of big wins for us, but the market develops and we're getting prepared for that to happen.

R&D is going to feature long term for us in this business. It's how we carve out different niches in the marketplace, and it's really how we want to grow the business going forward. We're looking long term to capital spending. We're building plants now in anticipation of market growth, so we'll be well positioned to win when the markets do develop.

And a couple of big opportunities there. We touched on those through some of the markets, but I think we're in a pretty good position in this area as well. So that's it from me. I think we're going to take a seat. Is that the - the three of us are going to take a seat, take the hot seats, and open it up to questions.

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**Geoff Haire, HSBC**

Two quick questions. My maths may be slightly wrong but you're targeting £400m of sales in your total package for coal to chemicals technology. If you're getting £10m or so of sales, that implies 30 to 40 plants that you are going to win. What percentage of the market share do you think that will be you're targeting?

And the second question is on the environmental side, my understanding is that coal to chemicals is one of the most carbon emitting processes, certainly compared to petrochemicals and natural gas. How is the Chinese government looking at their sort of overall carbon footprint versus the carbon footprint in cities, and could that change going forward?

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**Henry Liu, Country Director, China**

That's a very good question. Talking about, you know, the market value, we're talking about £300m, £400m. That's for the new plants which start from now to the end of the decade. And which we believe is quite a good chance for us to win most of the part of this business.

You're talking about the footprint of the carbon scenes you know in China, and it is a really good topic. And it's part of a debate now in China, and we know, you know, this is a part of the issue of the CO<sub>2</sub> emissions. But you know our technology, compared with alternative you know technologies, we have advanced to reducing a lot of those issues, and we have an advantage there.

But having said that, the Chinese government sees that as a strategical approach, because you know and they say that is strategical as I said in my slides earlier, because the key to that is energy security is important, very important strategy for China to go for. And there is a plan there, and they take a balanced view to that to see it. Because you know they are already starting to cut a lot of the less efficient plants such as in steel areas, and also they are talking a lot about renewable energies such as wind, hydro and solar which also help reduce a lot of CO<sub>2</sub> emissions in China.

So overall that's good of China's government doing since. They plan very well. That's why they're all approved since. I don't want to get out of control, so do it in a confirmed way. So I don't know whether that answered your question.

**Question**

I think I've got one question for Iain and one for Henry. The one for Iain, it's a bit of a debate on shortage or not shortage of C4 stream in the market. And as far as I understand one of the bottlenecks to get LPG or one butane back into butadiene is the dehydrogenation catalyst. Just was wondering if Johnson Matthey has the Holy Grail in the pipeline there to help the petrochemical industry?

And then the question for Henry is obviously you quoted Lurgi as one of your competitors in coal gasification. The Lurgi process is much older than the Davy process yet you're winning twice as many projects. Is there a technology angle there, or are you just cleverer salespeople, or what is happening there on the win rate versus Lurgi?

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**Iain Martin, Technology Director, Process Technologies**

Shall I do the first one? So the C4s in - the shortage of butadiene, was that the question? Well I would say it's an area of interest, let's put it that way. And it fits very well with our capabilities. I wouldn't say I have anything to announce just yet, but it's certainly an area of focus, yeah.

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**Question**

Can you be bit - sort of a pharma type language. Is it in phase one, phase two or phase three?

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**Iain Martin, Technology Director, Process Technologies**

Okay. It's showing a lot of promise. I'm not sure what the pharma, the two or three is, but yeah we're in good shape.

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**Henry Liu, Country Director, China**

Right, okay. In terms of the Lurgi competition. We do see them because this is a growing coal to chemical area. Everybody sees it you know as a big market and it's Korean, and they tried to get into there. And they are, because also another thing that you see a lot of now, corruption since - going on in China, every big, you know we're talking about our customers, almost the big state owned companies. They're all need an invite and these two to three technology provider to therefore bid. So naturally they were getting invited, you know that's not surprisingly they were invited more than once to bid for that project. So there are not many today in the marketplace to select for.

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**Iain Martin, Technology Director, Process Technologies**

But in terms of the question around the Lurgi technology, the older technology, the offering we have now is significantly different, and actually our catalyst is in that plant in the States so, as well. But it's moved on; the operating conditions are quite different to that technology now.

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**Question**

Excuse me for following up. There's different kinds of coal in China in terms of calorific content. Are you particularly strong in high thermal or low thermal content?

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**Iain Martin, Technology Director, Process Technologies**

The gasification side we don't participate in. So there's no catalyst there, and it's a competitive area, there's lots of people already playing there. So we don't actually get involved in the - we take it from the syngas in the gasification end.

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**Question**

And Davy the same, there is no - ?

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**Iain Martin, Technology Director, Process Technologies**

Yeah, it's the same.

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**Question**

Okay, thank you.

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**Question**

Thanks. A couple of questions. The MEG joint venture if you like with Eastman, a couple of questions. I mean that looks like a decent sized project. Are you exclusive on that? And secondly what's the timeline on that?

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**Iain Martin, Technology Director, Process Technologies**

Yes, it's exclusive. It's us and - it's technology we've developed together, so that's ours. And the timeline is we're starting to talk to customers, so we would anticipate that's now going to take probably 6, 12 months at a guess to actually get - at the earliest for the first contract I would think. But it's at - we're now just starting to talk to customers about it and test the market.

.....

**Question**

Okay. And a follow up, the second question, sorry China and coal again. I saw an energy review paper this week from the government showing a targeted 3% for coal production in China. This is probably an ignorant question because that's the whole of coal production and I saw your comment about power generation being deemphasised. My simple question is, is there a debate in China about the availability of coal for chemicals being an issue in the future? So could that be a bottleneck? Could that be a risk for all your growth rates?

.....

**Henry Liu, Country Director, China**

That's a very good question and actually we internally also evaluate that also. And actually you know there's enough coal there for more than 100 years if we continue this way today. And also it's proven, that's a proven reserve and also with proven reserves also we see there's quite more there. And also in our neighbouring countries such as Mongolia they have a lot of coal there. And if we, you know, try to see that's a competitive chemical route in future, and longer term, still that is available for us to use, such as Indonesia and not far away from China. From that perspective we don't think that's a bottleneck for coal to chemicals. And yeah you pose a good question.

Actually coal to chemicals today is only even say quite a big growth, but in terms of the absolute portion it's still small, it's 7% among all the coal industries. So it's small today and it's growing. And while there are just you know other areas you see not as much growth, or even some areas you see the reduction there of the coal.

.....

**Question**

Thank you. Just two questions from me if I can. The first is a lot of the growth is clearly coming from increased investment in certain industries which we're seeing a lot across just the chemical space generally at the moment. To what extent is the risk of over capacities in some of these markets a threat to the catalyst consumption, or does it not work like that? If plants reduce utilisation rates, do they just consume the same amount of catalyst? To what extent - because nothing ever goes up in a straight line from a compound growth perspective, so I'm just curious as to how that can fluctuate.

And then in terms of the margin, expectations going forwards are clearly positive in the PT business in general. Where are the highest margins coming through? Where is the mix effect in terms of those end markets? Is it from coal to chemicals, SNG, gas to liquids? Could you help us understand where the mix is really driving that margin up going forwards, despite the investments?

.....

**Geoff Otterman, Division Director, Process Technologies**

Let me tackle the last one first on margins. I would say that we typically get the highest margins where we can leverage the flowsheet expertise and the catalyst. And I think, you know, the Davy business I think you'll have known from previous analysis, the

margins are pretty good. So any time we can do that, that's where we'll win. So I'm not going to go into more details by product line on that.

Sorry, can you just clarify a question, your first question? When you're talking about over capacity, were you talking about in the end market or were you talking in the catalyst factory?



**Question**

No, in the end markets.



**Geoff Otterman, Division Director, Process Technologies**

In the end markets, okay.



**Iain Martin, Technology Director, Process Technologies**

I guess it depends a little bit market to market. Yes, you're right, the catalyst life is consumed by the amount of chemicals it makes. So if it's not operating then generally it won't get consumed. It's a little bit more complex than that, because actually in certain markets, if you like the swing capacity, if you take methanol in China, the swing capacity is small Chinese plants that probably don't use our catalysts so much. So actually out of the ones at the bigger and more efficient ones that are going to concentrate on using our catalysts are the ones that are going to be the last to shut down. So there is that. So yes, the effect is true. But actually we're probably slightly less affected by it than maybe others.



**Question**

Thank you.



**Question**

Hi, continuing the theme of two questions. So first of all for Henry, on the formaldehyde catalyst side, could you explain what the benefits are of the non-silver catalyst approach compared to the incumbent technology? And I think you mentioned that the non-silver market is about 40% today. Could you give us a sort of sense what might be a reasonable expectation in five years for its share of the overall market?

And then another one for Geoff. With regard to resourcing the US opportunity, the GTL and petrochemicals opportunity, will you need to add additional resource to US operations, either in terms of manufacturing capacity or people in order to address that opportunity towards the end of the decade?



**Geoff Otterman, Division Director, Process Technologies**

Okay, I'll do mine. I'll do mine while I can remember the question. On resourcing, yeah we'll definitely have to add more people in the US. We're looking to do that now already in terms of some of the technical, some of the salespeople, probably a bit R&D. But if we get a gas to liquids opportunity in the US, yeah it's likely that we would be putting manufacturing, a new manufacturing plant there.

And on formaldehyde, do you want to take that? Do you want to pass to?

.....

**Iain Martin, Technology Director, Process Technologies**

I can take it, or do you want it, Jane?

.....

**Dr Jane Butcher, General Manager, Chemical Catalysts**

You take it.

.....

**Iain Martin, Technology Director, Process Technologies**

Okay. We'll see. I can do the first bit. So yeah, the difference between silver and the oxide process. Generally the silver process is lower capital cost, less efficient. The oxide is more efficient but is more expensive. Actually that gap in terms of capital cost is closing quite rapidly as well. So that's basically the swing. So the small producers, distributed producers, particularly into China, have tended to go to silver. So that's the opportunity for us, is to actually focus down, get the capital costs down. And that would be what our target is. I think it would be difficult to say what the expectation of how successful we're going to be on that. I know Jane's nodding so that's...

.....

**Geoff Otterman, Division Director, Process Technologies**

Okay. Maybe a couple more and then we'll take a break.

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**Rakesh Patel, Goldman Sachs**

Just two quick questions if I may. First of all I wondered if you could give us some sense of the proportion of your R&D staff in China, just so we can see how that compares to the Group overall.

And then secondly, notably there seems to be some absence of your activities in the Middle East. I see you've only got two offices there. But I wondered perhaps if you could give us some colour there as there does seem to be petrochemical build out? Thanks very much.

.....

**Iain Martin, Technology Director, Process Technologies**

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In terms of R&D, as of today I would say we're not doing anything very much.

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### **Henry Liu, Country Director, China**

We do application I would say. Not mainly to R, probably a little bit to D, yeah.

.....

### **Iain Martin, Technology Director, Process Technologies**

But it is an area that we are currently planning now to start to build up. I think you have to ask what's the purpose, and I think it would be around more application, particularly around specific products for the Chinese market, rather than an expectation of doing sort of the core and fundamental R&D out there.

.....

### **Rakesh Patel, Goldman Sachs**

Just to follow up on that. Is there some impetus from the government for you to have your local R staff there, in order to sort of gain those contracts?

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### **Iain Martin, Technology Director, Process Technologies**

No, I don't think so. I've not come across anything. Henry?

.....

### **Henry Liu, Country Director, China**

That's a long term we see it. That's why another strategy we want to localise our production. And we want to seem to be a Chinese company as much as we can. So that's - today we didn't see this threat and there is no such things, you know, to say you have to be a Chinese company or a Chinese technology then to be selected. We didn't see that problem today. But long term, if the market continues to grow and we see that a long term threat, and we have to be seen as a local company as much as we can. So that's the plan we already developed.

.....

### **Geoff Otterman, Division Director, Process Technologies**

In terms of the Middle East I don't have exact numbers to finger, but I'd be guessing that Middle East represents about 10, 12% of our sales, something in that area. I can check that number\* and get back to you. (\*Number confirmed as 7%). What we have in the Middle, and we sell into methanol, ammonia, hydrogen. We're selling our additives products now in the Middle East. So we sell a pretty wide grouping of things, and we've sold I think they said some oxo licence in Middle East as well. So yeah, it's an important market to us. We have a number of technical people, technical salespeople who are based there.

.....

**Question**

Thank you very much.

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**Geoff Otterman, Division Director, Process Technologies**

You're welcome.

.....

**Question**

Just a quick follow up on the business model in general. So it seems like the main revenue drivers are licences, flowsheets and then the catalysis. What about the aftermarket service part? I mean you mentioned that technical service and these kind of things is a part as well, and the risk is a bit infectious that you are ending up painting the doors of your customers, and do a lot of things that help you be loyal with the customer but not getting paid for that. How important is the aftermarket sort of technical service bit and are you getting paid for that?

.....

**Geoff Otterman, Division Director, Process Technologies**

Well we would say that painting the doors of our customers is one of the differentiators in, you know, the overall service that we give to them. And we would say that we'd look to continue doing things for them and helping them run their plants as part of the premium price that we get over some of the competitors. So I would look that that's going to be a continued part of the package of things that we sell. It's really one of the ways that we differentiate our services versus some others.

Okay, why don't we break now for - ten past Sally says. So ten past, so it's about 15 minutes from now. And we'll come back and we'll get Don Roche talking about oil and gas.

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**Coffee Break**

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***PT and the Oil and Gas Market***

**Don Roche, Director, Oil and Gas**

All right it looks like we're ready to get started again, the good news is I'm the last presenter of the day so I know you're all glad to hear that, the bad news is I'm standing between you and a nice glass of wine and what sounds like a lovely dinner that we have planned for the whole group after the presentation.

Geoff wanted me to mention one thing quickly to you, there was a question earlier, I don't remember where it came from, it was talking about sales in the Middle East, sales in the Middle East as a percentage is about 7% of our sales, just to correct that point if we'd made that wrong.

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So let me introduce myself, my name's Don Roche, I'm the Director of the Oil and Gas businesses for JM, I've been with JM a grand total of almost three months now so pretty new to JM. Prior to that I spent 30 years at Shell in their refining and petrochemical downstream space, the last 7 years I spent running the chemical catalyst, CRI catalyst business for Shell. I'm really excited to have joined Johnson Matthey, I think particularly because there's such a great opportunity I see for growth in this technology and market space that we're participating in.

So I think there's grand opportunities here and hopefully what I can do for you today is give you a feel for the Oil and Gas sectors of the business that we participate in, give you a feel for where and how I see things growing for the company in this space and what maybe the opportunities are for us.

See if I can get everything working here. So just to remind you, I know it's been a while since we talked about this, the Oil and Gas sector of the PT portfolio businesses it's about 40% of the overall PT sales so it's about £240/250m per year so that's sort of the frame and the scale of the Oil and Gas businesses for Johnson Matthey in this PT space.

A couple of key points that I want to make to you here, I mean we break it down and you heard this from Geoff, so we break it down, we talk about the Oil and Gas sectors, the refining, we talk about it as gas processing and diagnostic services that's how we break it down. As you can see refining is the largest piece of the business for us, the refining catalyst business is the largest piece.

What you'll see is for us, as Geoff showed earlier, our growth rates in the markets that we participate in are above average I'd say, above what you see for GDP growth and above what you see traditionally around the larger Oil and Gas industry in general. I think what's interesting around these kinds of businesses you look at the strengths we have as a company around material science, around process expertise, around catalyst development and around analytical and measurement capabilities, I think that's what brings a real strength to Johnson Matthey in this space. It really creates opportunities for us to enhance the products that we make and capture value for ourselves and our shareholders.

So you saw this from Geoff again, he stole all my slides, this is a breakdown of the business, I'm going to go into more details around the refining hydrogen and the refining FCC additives business. But I want to talk in a little bit more detail right now on gas processing so just to give you a feel for what we do in gas processing in our Oil and Gas businesses here is gas processing for us is treating sulphur.

So these are absorbents or it's chemical technology, catalyst technology if you will that we've used to treat sulphur that's found in natural gas or we'll build reactors, we'll design reactors and we'll put catalyst absorbents in these small reactors to treat sulphur that before it goes into a natural gas pipeline or into an LNG facility to get those contaminants out so they don't ruin the process. So that's one of the key functions that we provide. We do the same thing for mercury removal around natural gas so that's the core of what we do around our gas processing business.

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Now this industry and this part of the industry is changing dramatically as we all hear, you see quite a lot of information in the news around the increased drilling for natural gas around the world and the different levels of contaminants that you see in different parts of the world. So in the Middle East for example we're seeing a lot more sulphur so some of the things that we're working on is getting into the units and the facilities that they need in the Middle East to treat sulphur.

In Africa and in South East Asia they seem to have a bigger and bigger problem with mercury in the natural gas that they're finding so treating mercury before it goes in these big LNG plants that you see down in Australia. Those are some of the things that we're doing in this natural gas processing space, gas processing area of our business.

The trends in this industry are also around moving towards lower capex, more capital efficiency, you're going to see this big in the news, I know all of you see and follow this but capital efficiency is a big part of what's going on in the drilling industry. So one of the things you see for example is floating natural gas, floating LNG, so the issue around floating LNG is getting capex down. What they say, what people claim around floating LNG is it takes a third of the capex out of a land based LNG plant. What we're doing in the gas processing space is working to design and reduce the footprint of our equipment to help treat the gas, to fit it on a boat with a smaller footprint, help reduce the capex and enable you know the idea of treating LNG, treating gas, getting it into LNG and then shipping it around the world.

So lots of changes going on in this particular space, we've got a small but targeted area that we participate in this gas processing space but it continues to grow and it continues to be really an attractive space for us where we make good money.

The next area I want to talk about in a little bit more detail is the diagnostic services portion of our business. This is a space where we bring quite novel technology and expertise and skills to some very unique problems that the Oil and Gas industry face, you know we're looking at things like for example taking chemical technology and analytical skills into fracking. So we can help an operator who's fracking a well, understand where he's getting oil, where he's getting gas, where he's getting water as he's fracking a well and he's drilling and actually help him to optimise and change their operations and reduce the inefficiencies of where their frack costs are.

We also take this technology and our skills if you will into another space into the subsea, one of the big issues that we're facing in the industry is we're going to deeper and deeper depths in offshore applications, we're going into the Arctic and in applications like that we're putting production units if you will on the sea floor, 3,000 feet below the surface. And we're actually putting equipment in those subsea production units if you will that actually help the operators manage and operate their equipment at these very low levels, managing the gas compressing units, managing the separators and actually winding up in the subsea. So really quite novel and quite difficult problems that the industry is facing.

We also provide, last example for you on this, but it's quite unique, it's around being able to analyse without being intrusive around the separator. So for example when you run an oil and gas rig you're going to have a vessel that all the oil and gas comes out of

and you wind up with oil or gas and sediment in your vessel, they call it a separator. We have equipment and capabilities to provide services to help the operator figure out when a slug is coming up the line, you know it's going to wind up plugging up their separator and actually if your separator goes down you're in real trouble, your production goes down. So what we bring is capabilities to actually help the operators figure out how they're running their equipment more effectively. So quite unique and quite interesting technologies and capabilities that we bring that really add quite a lot of advantage to these Oil and Gas operators in the field.

All right now I'm going to dig into some details, you've seen this before, hopefully you don't go to sleep on these presentations, I've only got two slides here that I'll talk about in this kind of detail. So the first is around our hydrogen catalyst business you know so the hydrogen catalyst business again just to scope it out for you, this is a narrow but targeted area where Johnson Matthey's had a unique advantage for a very long period of time. Roughly this about £150m to £200m per year type business, that's roughly what we think the market is for this and we get about 40% of that total. Now of course it changes from year to year, you get new units that are brought on and you get refill business that adjusts those numbers but you can see from the totals we're really quite a strong player in this market and have been for a long period of time.

Now what's interesting, this is a complex market and someone asked the question earlier and must know quite a lot about this but the industrial gas portion of this business or segment of this business it is a very important part of the hydrogen market, a very important customer segment for the hydrogen catalyst business. So players like Air Products, Praxair who go out and build hydrogen plants to supply to refineries or petrochemical plants it's a big segment of this market. One of the advantages that we've had in building and growing this hydrogen catalyst business has been actually the partner with folks like Air Products and Praxair to really grow our business together and find strength and capabilities as we move forward.

Keys to success in this business really is around the core strengths of JM which is around building better catalysts, it's the material science research that we do, it's understanding the process technology of how hydrogen plants are built and how they operate. But really this is a technology play, it's around having the best product, having it at the most reasonable price that creates the most value for the customer and also provides a good value back to JM.

I'm going to dig into this next area and this is really a quite interesting space for me, this is the FCC additives business, this is one that you heard from Geoff earlier, this was the Intercat acquisition that we made back in 2010. Intercat was an independent company and they built actually quite a leading position around FCC additives. And what they brought when we bought them, what they brought to JM was actually quite some interesting skills and capabilities around fluidised bed processes so it's quite a different set of process conditions and economics than you see with fixed bed, which is traditionally where we work in the Davy area. And they also bought us actually, to JM actually, some really interesting material science capabilities so around these FCC additives they're dealing with mesoporous materials, zeolites and unique materials that actually have been used around the FCC business, the FCC additives business for actually quite a long time.

We're excited about this space, you know now that we've put the market growth, this market is roughly about £150m per annum and again we have about 40% of that total so really quite a strong position. Now the definitions around this market are a little difficult because it's not exactly the same everywhere, you get big players who sell the base catalyst and they include the additive with the base catalyst so it's hard to get exact measures but that's roughly what we think the size and scope of this market is.

But there's a lot of good opportunities and this continues to grow, I mean the changing environment around refineries particularly, we mentioned it earlier, I think as the chemical industry changes the refining and petrochemical industry are coming closer into integration.

So what we're seeing is big issues as the chemical industry changes, feedstock moves towards lighter feeds, they're running into shortages around propylene, they're running into shortages around C4 coming out of your chemical crackers, you're running into shortages around aromatics so we're creating supply disruptions. Now refiners are sitting over here, these greedy refiners who make FCC units and make gasoline and other components out of these FCC units, they're looking and saying well if I put this unique additive from Johnson Matthey in I can make more propylene out of my FCC unit, potentially I can make more C4s out of my FCC unit or potentially if JM gets really creative they can do some other things to create chemical products out of what's traditionally been just a refining engine, the FCC unit's the heart of a refinery, it's only a few big key kits of conversion in a refinery.

And the FCC unit is really one of the most important units in a refinery and so if we can help the refiners actually start to make more margin by making chemical products out of their FCC units we're really helping them to not only diversify but actually step up their margins that they're making out of their FCC unit.

But what I'm going to leave you with before I turn the page on this one I mean I think it's quite an important story, I mean what I threw up here, what Johnson Matthey did for this business I think is really quite impressive. Johnson Matthey took an independent company and wind up committing resources to expand the capacity so we've just completed, I think Iain mentioned it earlier, we just completed the expansion of a new plant at Savannah so a \$45m plant that you see over on the right with that fancy picture. We've invested quite heavily actually in the R&D in Savannah, the picture on the left here is micro reactors that we use actually to test the catalyst, the FCC additives in application environments to determine and develop new products and actually do product quality assurance testing, etc.

But we've invested quite heavily in the site, in autoclaves, in new testing equipment, as well as analytical equipment which I think is really quite critical because it's the analytical capabilities that Johnson Matthey has brought to the Intercat business that has really enabled quite significant breakthroughs in understanding the surface science of these mesoporous materials and the surface chemistry on how you can start to make changes, develop new products and create new opportunities.

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So it's really quite exciting, quite a good environment where the trends are moving towards, very favourable for us because it means our customers, our FCC unit operators and owners are looking for new products and new opportunities to put additives into these FCC units to change what they make and to change how they make them. So really quite a good story for multiple perspectives, I see it from the JM perspective.

Okay so here's my interesting cartoon, and I'll say to you we're early on in this journey within JM with the PT organisation but I just mention this, one of the things that we're starting to see is how do we build and expand on and leverage the capabilities that we have across the whole PT portfolio.

So one of the things that I see that I was just talking about, for example this Intercat acquisition where we took fluidised bed technology, process technology, we took zeolite material science capabilities, what that starts to open the door for us is for example as it moves over into the chemical space, you know when we take fluidised beds and zeolites in the chemical space it starts to open the doors for us potentially to get into processes like methanol to olefins, methane to aromatics. A number of different chemical processes that actually use fluidised beds and zeolites as we move towards a gas orientated feedstock for the chemical industry, these process technologies and these materials are going to be critically important and open doors for new opportunities for us moving forward.

On the other side of the fence, coming back, you know the expertise that we have in Davy around fixed bed processes and fixed bed analysis, base metal and PGM catalyst are actually quite applicable to many and most of the refining applications that we have. And so there's quite a lot of synergies and a lot of opportunities for us to leverage skills and capabilities across both sides.

And then underlying it both, and Iain spoke to this as well, is that, and I see quite a lot of this actually around the Savannah site you know first-hand, is that the manufacturing excellence programmes that I see going on in Johnson Matthey now are some of the best that I've seen in my career. We're really making significant improvements and I've seen a real strong culture around Lean Six Sigma in Johnson Matthey and that's making a real difference, it's driving cost down, it's really driving opportunities. Now nobody's going to probably stand up and say it's changed the results for this quarter but I think the reality with the Lean Six Sigma is you make it a cultural change and that's how you find ongoing continuous improvement in your operating cost.

So I see that and I see that going on and I see that as a real capability that as we grow this PT portfolio this is going to be one of the areas that we're going to have to leverage and it's a strength that will leverage as we move and grow, add more plants, make more acquisitions, these are the kinds of things that we can leverage in my view.

And the last one as well that I mentioned is this research and scale up capability, this is the core of catalyst development in a catalyst business, you know being really good around material science expertise, your analytical capability to understand things at a molecular level, be able to scale it up, take things from the lab and actually scale it up to full scale manufacturing this is, I mean the Davy process technology scale up, these mini plants I haven't seen that anywhere in the industry, in my 30 years being around I

## Johnson Matthey - Analyst and Investor Day 2014

haven't seen that kind of capability to scale things up anywhere. And I think that's the kind of things that are unique advantages that we've got to start to deploy more broadly.

So I'll move on from that, and I'm near the end here so we're getting close to the finish line. This is one of the last charts but I want to leave you with a few key messages and this is what I want to say, the trade winds are blowing our direction, I'm a sailor so you know I have to use my sailing analogy here. The trends are moving in our direction, you know we have changing feedstock, we've got shale oil in the United States which has more metals, you know that more metal, heavier metal content of the oil that's being put into refineries in the US it's opening new opportunities for us for these FCC additives to treat these higher metal content, the shale oils. We're seeing shale gas which is opening the door for more activity for us in our gas processing industry, more drilling in general which is opening up more opportunities for us in our diagnostic services business.

You know the drive towards cleaner fuels, you know Geoff talked about it but around the world, well now actually even with shale oil, and I'll talk about the United States being an American here a bit, is that the United States we keep talking about being energy independent but now the United States is going to, all of a sudden going to exporting gasoline and diesel. And so the standards around clean fuels actually as the world starts to transport and export, you know transportation fuels, we're going to get to a normalised standard actually for low sulphur which is going to drive more hydrogen.

We're looking for more diesel in the world as a clean fuel, when you build, you need diesel you're going to have to build hydro crackers, when you build hydro crackers you're going to need hydrogen plants. These are driving changes that are helping our core set of technologies in the businesses that we're in and it's going to drive our growth over the next five to ten years.

And I kind of probably beat a dead horse here around the capabilities but I really feel strongly about this, I feel strongly that it's the strengths that we have around material sciences, process expertise that you've heard from all of us and you know it's catalyst scale up and development and it's analytical skills and capabilities. That's what's going to create an environment where I think we're going to be in a position for accelerated growth, building new plants and our existing businesses, building new research, creating new products, helping to improve our margins. But then also positioning us well actually to make targeted acquisitions in adjacent areas, that's what I see as a real strength going forward.

Okay last chart, I know you're relieved now, everybody take a deep sigh. I want to leave you with four points so my four points that I'll leave you with here are you know leading positions is where we have, this oil and gas technology although not enormous but we have very strong positions in the parts of the business that we participate in. The segments that we are participating in are growing faster than the market so this is very attractive spaces for us to be in. We're continuing to invest in the capabilities that we have so our R&D investments are continuing to grow, we're building more testing equipment, we're building more capabilities, we're adding more scientists to continue to add to our advantage around our skills and capabilities and products that we offer.

We're starting to leverage that grand cartoon that I wrote, we're actually starting on this journey to try to leverage and open up opportunities from the capabilities that we currently have and I think that's the real strength of growing a company is building on those leverages and the strengths that you have.

But we do have opportunities to accelerate the growth because of the trade winds, because of our capabilities, I think it puts us in a grand position actually to continue on the path of growth that we've been on and do better than double, well we anticipate currently now doubling our revenue by the end of the decade. I think if we continue down this path and we leverage these skills and capabilities I think we have ample opportunity to do better than that over the next ten years.

With that I'll end and I'll let Geoff wrap it up.



**Geoff Otterman, Division Director, Process Technologies**

All right well thank you Don, especially for reminding us that you're an American, I'm not sure how many people actually picked that up along the way so, no okay. All right, so where are we. Well I thought I'd just wrap up a bit, I'm not going to regurgitate in that slide, a similar slide I went through before but if wrap up some of the themes of the day really.

Thinking about the Technology part of our business, just a reminder that the sweet spot for us is the confluence of the flowsheet design catalyst and the knowhow, really just putting that all together for us to carve out a unique place in the marketplace. How are we going to do that, continue to invest in R&D and a look to the future and we are doing that now, we're expanding our R&D capabilities in Northeast, just ready to open a new facility there, going to be adding in Savannah so it's a key part of what we're looking to do in the future.

In the Chemicals area well we talk about Syngas, petrochemicals, oleo, bio, really how we want to look at the businesses, quite keen to expand those areas and we want to anticipate the growth that's in the marketplace. So we're resourcing up for that now, looking to put new plants in, new capacity and put it in the appropriate parts of the world for us.

And Oil and Gas, well Don just went through additives, hydrogen, gas processing and our diagnostic areas. And looking to expand there, I really like the thoughts that we have now and how we leverage even some of the newer acquisitions and potentially something broader overall for the company.

So some of the themes that I guess jotted down, I look, listen, constant theme on the Technology performance products, talk about analytical capabilities, the market knowledge, investing for the long term. Really trying to do all that we plan to win and we're looking forward and we want to win in this game.

There's a couple of things on some of the number type parts. Just give you a little bit more on the sales, on the sales growth prospects, if we look at methanol for example I

think we talked about 6/7% growth, it'll be lumpy there's no doubt about it, it depends on what happens with customers. Ammonia we think should be steady but then again the plants come on that could be lumpy. The substitute natural gas bit of a ramp up in the next couple of years, pretty steep growth and then probably level off a bit. Gas to liquids well that's again a big play for us and hopefully a bit of revenue the next 3/4 years and if something takes off then the revenue will take off pretty quickly on the back of some big investments.

And some of the things in the refineries area, yes we'd think we'd see pretty stable growth in those areas. So got a bit of a mixed bag in that, some lumpy some coming later on in the decade and some happening now. So all told we think that there's scope for us to take the revenues from just a bit south of £600m sales, up to something approaching £1bn in sales by the end of the decade. So depending on a couple of, how the trade winds go it's going to be upper single digit, maybe low double digit sales growth.

When we look at margins, right now the Chemicals area is roughly 20%, Oil and Gas mid teens, I expect that to stay the same, we'll certainly push hard to try to improve it but I don't see significant changes in those. Along the way we'll look to get a lot closer to the JM Group target of 20% on the return on capital so hopefully it's a more efficient use of the capital that we've put in place.

So all that and toe well I think that's probably it for me. So I think Neil's going to come up, I think do a bit of a wrap up and we have a bit of time, no sorry I'm doing questions now, sorry, well Neil you can take the questions. So we have ten minutes for questions or something?

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**Neil Carson, Chief Executive**

Yeah and I didn't really need to do much of a wrap up I don't think because that's all been really very well done by Geoff and his team, I hope you will agree. So while they're assembling just really just a few thoughts from me, and they go back because I go back a long way in Johnson Matthey but in the year 2000 we had nothing here, we had a few small products in the PGM, on the supported PGM area, a few million of sales, I doubt it was 10m, I haven't got the numbers in my head.

And then you know over the next few years as Geoff has painted the picture for you, we don't make a lot of acquisitions in Johnson Matthey but when we do make them we put a lot of care and attention into making sure that they're the right ones. And I think you have to agree that the four key acquisitions that we made here starting with the ICI business, Syntex, as the kind of base load of base understanding in non PGM catalysis. And then adding in Davy, Davy was a company we'd known for 40 years and worked with alongside for all those years but someone had the clarity of thought to say this would really fit nicely with the Johnson Matthey business. Amazingly Davy had been owned by a lot of people but never by a catalyst company and catalysts are an absolute keystone of the processes that they put together, that ended up a fantastic acquisition and then along came Intercat a few years later.

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And so you know that collection of acquisitions has made a massive difference and now okay it's 20 years later in 2020, Geoff's talking about a £1bn worth of sales where there were none 20 years ago, okay that's 20 years, that's quite a long passage of time but the trip from where we are today, I now see that we've got all the pieces in place here, I hope you agree and the trip from here of 600 to 1bn seems like a pretty robust thing.

You've heard from the guys, you've heard from Geoff to paint that picture, you've heard from Iain and the key things that I think you should take home from Iain are that we're good at the technology, we're really good at the technology, he said so, he's a very understated kind of gentleman, he said it about 12 times, it's true. We are very good at the technology and you have to be to take a leading position here.

We're well placed in some of our markets, in the Chemicals side the way Geoff has brought a bit of focus here to the way we define our business in the Chemicals and then in the Oil and Gas area, I hope you've got a bit of clarity on that from Iain's second presentation.

And then from Henry, Henry's the man at the coal face in China where a lot of this activity is going on and it's the coal face too, there's no shortage of coal, anyone worried about that I hope Henry would have addressed that issue. And we're incredibly well placed in China and it's going to be an exciting place for us to be, of course they'll be periods where things slow down and then periods where they speed up again but I don't think that's anything that we ought to be too concerned about because the drivers are there for a very successful business and an increasingly successful business for us in China.

And then it was really great to hear Don's review of just three months work with Johnson Matthey so he's a very good addition to our team, we're delighted to have him on board and some of his insights are absolutely true. One of the key things that we can do is work out in a little reactor that big what a new catalyst would do in 600 tonne reactor out there in the real world and that's a massive strength and one of the things that really attracted us to Davy when we first looked at it.

So there's my kind of quick summary so exciting prospects going forward. And let's throw it open to questions, questions on I'm sure what you've heard, what else you would like to know about PT, perhaps even any other questions on the company if you would like and I will delegate those to the new Chief Executive who's sitting in the front row here. So any further questions?

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### **Peter Cartwright, Fiske**

It's a question for Don really for the downhill stuff because I must say I haven't heard Halliburton Company say, we didn't get where we are today without the input from Johnson Matthey so what is it you actually sell down the hole?

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### **Don Roche, Director, Oil and Gas**

So what we provide, and again as I tried to mention actually we're a very narrow player in this enormous market so Halliburton Company, I mean I heard a number the other day with this little consultant we're working with, they spend \$30bn a year fracking and fracking costs per year. What we provide to about, right now it's about 1% of the market, what we provide is tracing services. So we actually put tracers down hole into the frack fluid, you know when they frack a particular section we'll actually put the tracer down, it will put different tracers into different sections of the frack right so they'll have different sections of the frack. And then what you can to start to see from that is which frack sections are actually delivering oil and gas because you detect it when it comes back to the surface.

So that's an area that it's actually providing quite a lot of good insight, it's very immature at the moment so not many people are actually using these sort of tracer services actually to improve their frack and their frack performance.

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**Peter Cartwright, Fiske**

These are metal chemicals?

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**Don Roche, Director, Oil and Gas**

Speciality chemicals that you know that our fine scientists and Tracerco have developed and are finding good uses for it.

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**Question**

They're not long questions, the first was maybe for Robert just with regards to what we've heard today how we see the Capex for the Group evolving given there's clearly more investment going in to PT, any guidance on that would be helpful? And I was just curious on the bio based products who are the customers that are emerging in that market for your catalyst going forward, thank you?

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**Robert MacLeod, Group Finance Director**

The capex level I would say, we've said before it's going to average around 1.5 to 1.7 times, I think that's still real although we've got two times here in this division, I think you heard last year, from what I thought quite a good presentation actually last year Martin, but you heard last year from John that his business the Capex will start going down towards, I think he said 1 times last year. But you know we're going to have a bit of a crossover here where you're going to have a ramp up of capex in Process Technology and a gradual reduction of Capex in ECT so blended average you know 1.5ish.

And then as Geoff talked about he talked about GTL opportunity, if we have GTL opportunity that comes if it comes, as you've heard we believe there's the opportunities there then there'll be a lumpy bit of capex to build a new plant to enable us to make the capex, to make the sort of catalysts I should say. So if that were to happen then you

might see us drift up to 1.7 or something or whatever it might be but there or thereabouts.

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**Iain Martin, Technology Director, Process Technologies**

On the customers and the bio side, it's a bit tricky to name names to be honest but they are I guess the start up companies in the US particularly, some elsewhere as well that are developing technology into this area, there's a bag of them around. We mentioned Myriant earlier because that's one we can talk about but that's the kind of thing we're doing where it's either adjacent or we have particular catalyst skills that fit then those are the kinds of companies that we're working with.

Then we have the existing businesses, well the MDA is mainly the palm oil producers. We also have technology with Endicott who is a bio diesel manufacturer based in the US. And then we deal with most of the fat hardening and the odour chemicals industry as well.

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**Question**

Thanks very much, two questions please. On the catalyst side what percentage actually involved PGMs? And secondly on the flowsheet design side is there ever any risk for JM or does the risk always get assigned to the client when you're going from the mini plants up to the sort of full scale plants?

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**Geoff Otterman, Division Director, Process Technologies**

I'll handle the first one, Iain will handle the second. The PGMs part of our business is relatively small, it's got to be under 10% of sales, maybe 5% of sales so it's really a narrow market we sell in.

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**Iain Martin, Technology Director, Process Technologies**

And in terms of the risks side on the design side I think there is risk but it's relatively small, it's certainly within the revenues that we actually receive is generally the principle there so the majority of the risk is not ours to take. Clearly occasionally we have kind of reputational risk, we sort of go a little bit beyond that but generally it's not huge.

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**Geoff Otterman, Division Director, Process Technologies**

Anything else, or is everyone thirsty? Okay well thanks again for coming, it's been a pleasure to share some of the opportunities that we see going forward and we'll be around, my team will be around at dinner time so look forward to chatting with you a little bit further.

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**Neil Carson, Chief Executive**

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Shall we put our hands together for the presenters today because I think they did a good job. And see some or all of you later, thank you very much.

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END

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